cgs civils

Consulting Civil Engineers

Foul and Surface Water Drainage Report

The Grange, Westergate

For

Deborah and Christopher Blows

Rev – **P1**

Reference **C3388**

Date **10th June 2025**

Revision	Date of Issue	Comments	Prepared By	Checked By
PL-	10/06/2025	Initial Issue	MR	CS
P1	06/11/2025	Updated ADC requirements	MR	CS

Contents

1 Introduction

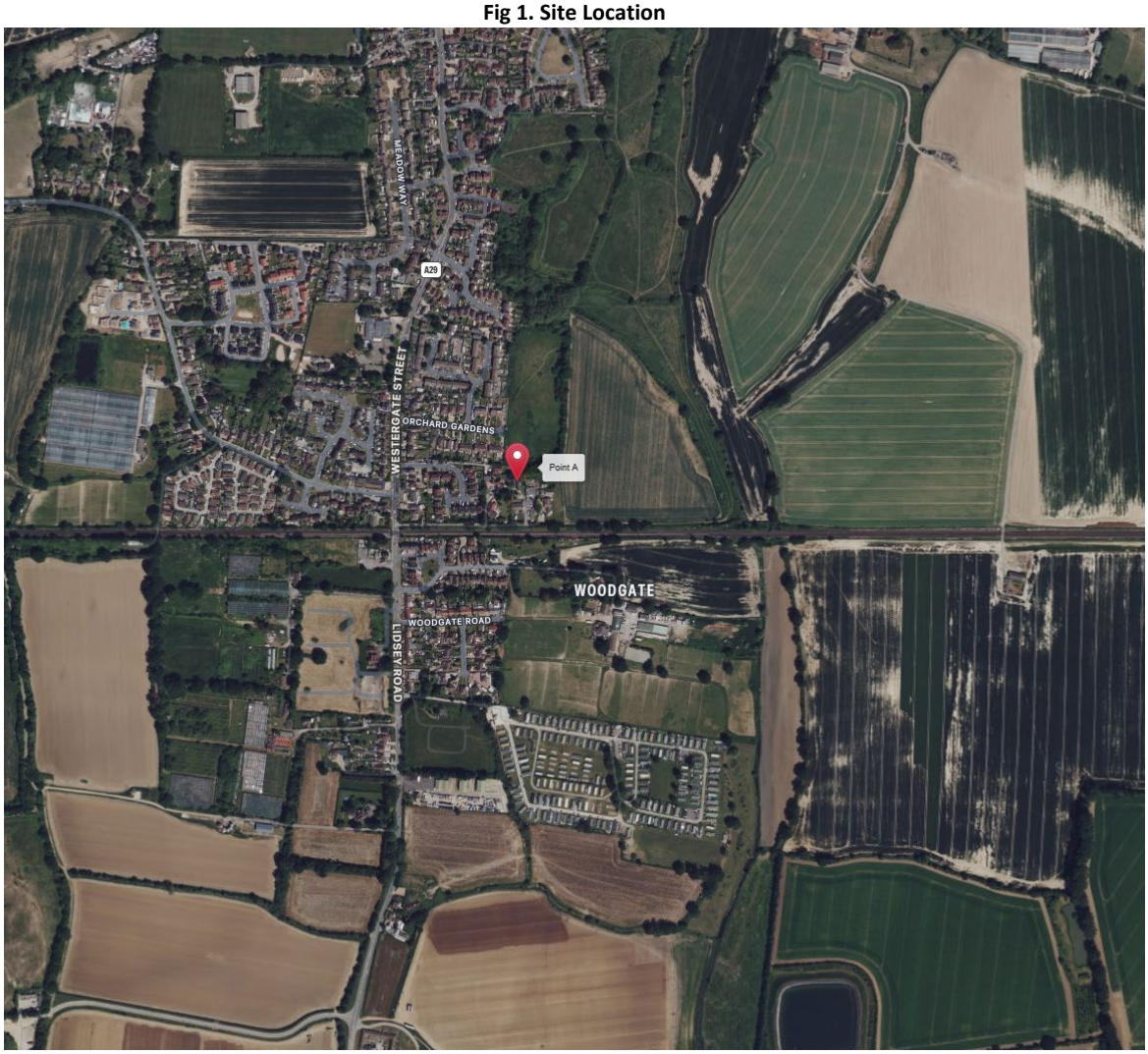
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Land north of the Grange, Westergate.

1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere.

1.1.3 The site currently contains a mobile home. The proposed development will compromise a new residential dwelling with a garage and, driveway and associated parking space. The proposed development is located as OS Grid Reference **SU 93979 04401** and has the post code **PO20 3SQ.**

1.1.4 The proposed site layout can be found in **Appendix A.**

Fig 1. Site Location



2 Executive Summary:

2.1.1 Surface water runoff is to be discharged into the existing ditch located to the north of the site. All roof and hard paved areas are to be collected into a positive drainage network before discharging into the ditch at restricted flow rate of 1.0 l/s. The proposed drainage network has been designed to cater for the 1 in 100-year +45% storm + 10% urban creep allowance.

2.1.2 The foul water will discharge to an existing foul water manhole located onsite. This connection is subject to Southern Water approval under a Section 106 agreement.

3 Site Geology

3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up London Clay Formation- Clay, Silt and Sand. The BGS website confirms the superficial deposits on site to be made up of River Terrace Deposits- Sand, Silt and Clay.

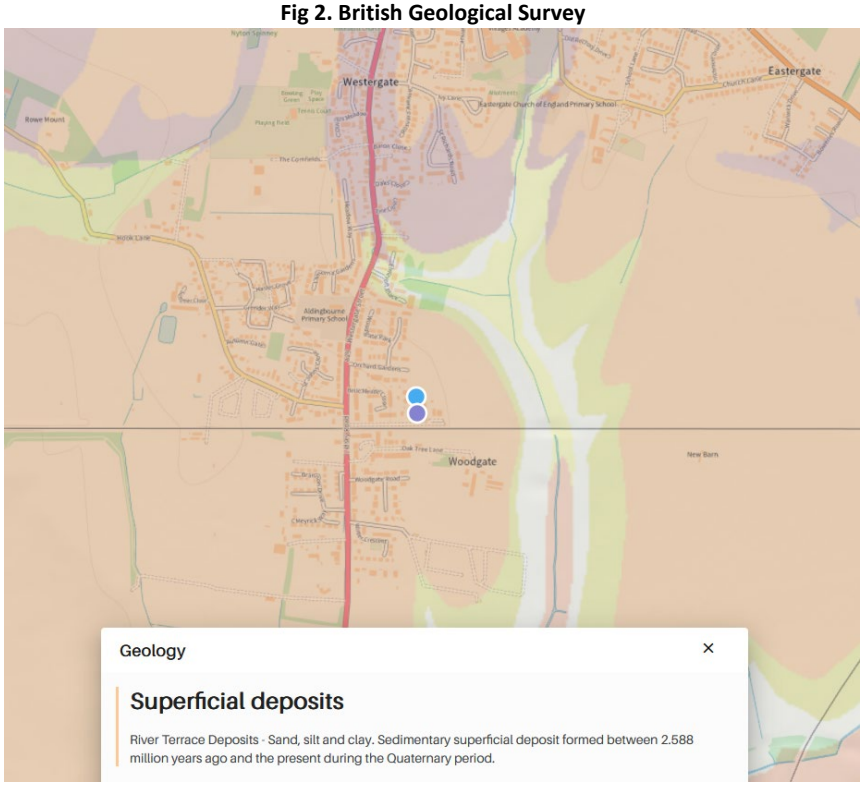
3.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.

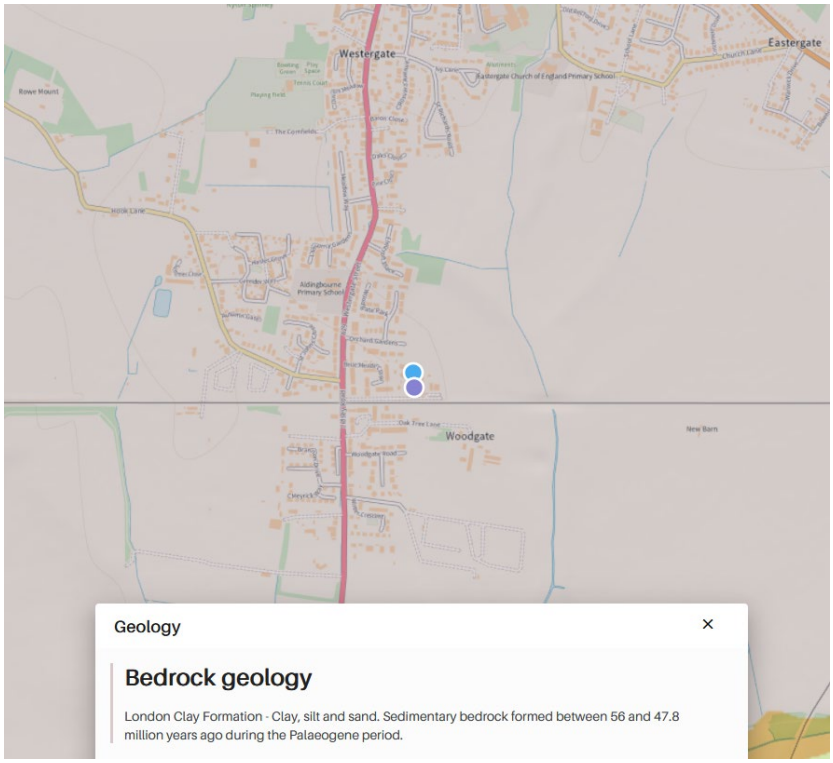
- Borehole **SU90SW51** (Located approx. 600m North-East of the site) – Ground geology (Clay, clayey sand)

- Borehole **SU90NW72** (Located approx. 750m North of the site) – Ground geology (Silt, clayey gravel, pebbly sand)

- Borehole **SU90SW56** (Located approx. 400m South of the site) – Ground geology (sandy brown clay, clay with stones)

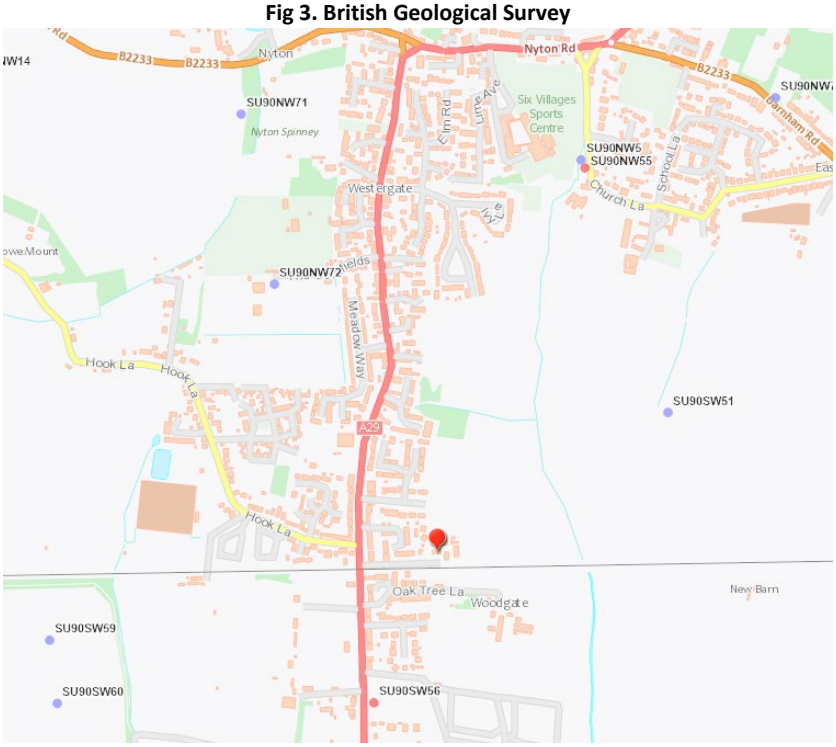
Fig 2. British Geological Survey





Snippet from BGS Website showing Bedrock geology and superficial deposits
http://mapapps.bgs.ac.uk/geologyofbritain/home.html?

Fig 3. British Geological Survey



Snippet from BGS Website showing Historical Borehole Logs location

3.1.3 The Historical Borehole Logs can be found in **Appendix B.**

3.2 Geological Assessment

3.2.1 Groundwater monitoring and soakage testing was carried out by Ground Management Ltd on 2nd May 2025. The investigation included the excavation of 2 No. boreholes, each to a depth of 3 metres below ground level (mbgl). A standpipe was installed in each borehole to facilitate ongoing groundwater level monitoring. Groundwater levels were recorded regularly between 3rd December 2024 and 30th March 2025. The highest groundwater levels observed were 0.780 mbgl in BH1 and 0.830 mbgl in BH2.

3.2.2 An infiltration test to BRE365 was conducted within a trial pit on site. As per BRE365, 3 No. tests were performed within a trial pit measuring 0.3 x 0.5 x 0.6m deep. The worst-case recorded infiltration rate is 3.04 x 10-6 m/s. No groundwater was encountered within the trial pit during testing

3.2.3 The groundwater monitoring and soakage testing report can be found in **Appendix C.**

4 Existing Drainage

4.1.1 It is not currently known how existing site discharges surface water runoff, however it is presumed that all surface water runoff is discharged into ground via infiltration.

4.1.2 A ditch has been identified along the northern site boundary within the tree area, and it is assumed that this ditch connects to the existing watercourse located approximately 290 m to the east.

Fig 4. Existing ditch draft on Statutory Main River Map

Fig 4. Existing ditch photos

5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	**YES**- Rainwater harvesting tank has been proposed
Discharge to Ground	**NO**- Due to high groundwater levels onsite infiltration method for surface water discharge has been ruled out
Discharge to Watercourse	**YES**- All surface water runoff from roofs and hard paved area is to be discharged into the existing ditch located to the north of the site at restricted flow rate of 1.0 l/s
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	No surface water discharge permitted to existing foul sewer owned by Southern Water.

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1.00**
CV Winter and Summer	**1.00 / 1.00**
Additional Storage (m^3 / ha)	**0.0**
Flow Control	0.458 Head 1.0 l/s
Permeable Paving Design	Base Coefficient (m/hr): **0.0000**
	Side Coefficient (m/hr): **0.00000**
	Factor of Safety: **2**
	Porosity: **30%**

5.3 Surface Water Drainage

5.3.1 Based upon the groundwater monitoring report, it is proposed that the site will discharge all surface water into the existing ditch located to the north of the site. All roof and hard paved areas are to be collected into a positive drainage network before being discharged into ditch at restricted flow discharge rate of 1.0 l/s.

5.3.2 Groundwater monitoring and soakage testing confirmed that the site is underlain by a relatively high groundwater table. The highest recorded groundwater level was 0.830 m below ground level (mbgl) within borehole BH2, located in the area of the proposed driveway. As a result, the use of infiltration methods for surface water disposal has been ruled out, as the site conditions do not meet the required 1m clearance (freeboard) between the base of any infiltration device and the maximum groundwater level.

5.3.3 All surface water runoff will be discharged into the permeable paving system, which incorporates a 470 mm thick voided sub-base providing the required surface water storage volume of 29.61 m^3. Surface water runoff from roof areas will be conveyed to the voided sub-base via distribution tanks. The permeable paving system is protected against groundwater ingress through the use of an impermeable geomembrane liner with protection fleece.

5.3.4 A discharge rate of 1.0 l/s has been adopted to minimise the risk of potential blockages within the flow control orifice chamber and the proposed drainage network, thereby reducing the likelihood of flooding on-site and to neighbouring property.

5.3.5 The proposed bioretention planter is designed to reduce the required storage volume within the permeable paving voided subbase by providing additional storage. Surface water runoff will be temporarily held with the planter before discharging into the voided subbase. To comply with *Standard 2 of National standards for SuDS*, a lined bioretention planter unit is proposed and designed to capture, convey, and store the first 5 mm of rainfall.

5.3.6 To ensure that the drainage system remains free from obstruction by leaves, debris, and sediment, it is proposed to install a RainTaina filter chamber at locations where rainwater downpipes are not connected directly to a catchpit chamber.

5.3.7 The drainage network has been designed to accommodate a critical 1 in 100-year storm event with an additional 45% allowance for climate change + 10% urban creep.

5.3.8 The proposed rainwater harvesting tank is proposed to enable water reuse and to provide additional surface water storage within the drainage system.

5.3.9 The only alternative surface water discharge point identified is an existing foul water sewer owned by Southern Water. However, Southern Water does not permit the discharge of surface water into the foul sewer network.

5.3.10 Proposed Drainage Strategy, Contributing Area Plan & Exceedance Flow Routes, Proposed Typical Construction Details and Hydraulic calculations have been carried out which can be found at **Appendix D.**

5.4 Water Quality

5.4.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.

5.4.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.

5.4.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e., the pollution source)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
- The sensitivity of the receiving environment

5.4.4 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1 from SuDS manual. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	**Hazard Characterisation**	**Risk Reduction**	
		For Surface Water	**For Groundwater**
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

5.4.5 As per Table 26.1 Simple Index approach will be used as a design method for this site.

5.4.6 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.

- Residential Roofs
- Individual Property driveways and residential car parks
- Low traffic roads

5.4.7 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index >=pollution hazard index

5.4.8 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Table 26.2 from SuDS manual. Pollution Hazard Indices for Different Land Use Classifications

Table 26.2 Pollution hazard indices for different land use classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended solids (TSS)**	**Metals**	**Hydro-Carbons**
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (Typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

5.4.9 From Table 26.2 the following information is tabulated in Table 1

Table 3: Pollution hazard index and destination of runoff for the proposed site

Table 3: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	**Destination of Runoff**	**Pollution Hazard Level**	**Total Suspended Solids**	**Metals**	**Hydrocarbons**
Residential Roof	Surface Water	Very Low	0.2	0.2	0.05
Individual driveways, residential car parks and low traffic roads	Surface water	Low	0.5	0.4	0.4

5.4.10 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Table 26.3 from SuDS manual. Indicative SuDS Mitigation Indices for discharges to surface waters.

Table 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
	Mitigation Indices		
Type of SuDS Components	**TSS**	**Metals**	**Hydrocarbons**
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 4: SuDS mitigation index

Table 4 Mitigation Indices						
Runoff Source	**Destination of Runoff**	**Mitigation Index Source**	**Type of SuDS Component**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Residential Roof	Ground water	Table 26.3 (for surface waters)	Bioretention Planter	0.8	0.8	0.8
Individual driveways, residential car parks and low traffic roads	Ground water	Table 26.3 (for surface waters)	Permeable Pavement	0.7	0.6	0.7

5.4.11 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5.5 Foul water drainage

5.5.1 The foul water will discharge into the existing foul water manhole located onsite. This connection subject to approval of a S106 application by Southern Water.

5.5.2 A CCTV survey should be undertaken to confirm if a connection onsite is possible and if remedial works are required.

5.6 Construction Phase Drainage

5.6.1 It is an offence to cause or knowingly permit the entry of any polluting, poisonous or noxious material in the water environment. If the pollution is serious enough to lower the ecological status of the water body as set out in terms by the Water Framework Directive (2000/60/EC) than prosecution may occur.

5.6.2 Remediation of any damage caused will not require the polluter to be prosecuted first. If the water pollution is serious enough to be classed an environmental damage, the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.

5.6.3 If any pollution has not been reported or the polluter has not taken actions to prevent any further damage; they would then be causing an offence. Third parties (e.g., Private water supply users, landowners, recreation users and the public) who may be affected by possible damage may also report the risk of any environmental damage to the enforcing authority.

5.6.4 The principles of SuDS (Sustainable Drainage Systems) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or the water quality shall:

- Soakaway where soils allow
- Consider and manage erosion
- Remove pollutants in surface water
- Retain any silts on site and prevent silts from discharging to watercourses or drains
- Keep runoff rates at existing greenfield runoff
- Prevent accidental spillages reaching watercourse

5.6.5 As infiltration on site is viable, the temporary drainage for the development will be in the form of land drains which will discharge into the ground.

5.6.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.

5.6.7 Any potential hazardous substances will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed by to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the construction of a new residential dwelling with garage and associated driveway.

6.1.2 The Surface Water will discharge into the existing ditch at restricted flow discharge rate of 1.0 l/s. The drainage network has been designed for a critical 1 in 100 year + 45% storm event + 10% for urban creep allowance.

6.1.3 The Foul water will discharge into the existing foul water manhole located within the site boundary. The proposed connection is to be agreed under Southern Water S106 application.

6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

7 Appendices

7.1 Appendix A – Site Plan

A. BINS AND BIKES WITHIN STORAGE IN PRIVATE GARDEN AREA

B. TURNING FOR REFUSE AND FIRE APPLIANCE AS PERMITTED REF: AL/28/21/PL

C. SITE ACCESS AND BIN COLLECTION POINT

D. 3 No.CAR PARKING SPACES

E. DOUBLE GARAGE 2 NO. CAR PARKING SPACES

F. IN AND OUT DRIVEWAY

PROPOSED SITE PLAN

0 10 25m

Scale 1:500 @ A3

- DRAFT -

Smith Simmons & Partners

01243 850411 **office@ss-p.co.uk** www.ss-p.co.uk

REV 01 xx.xx.xx

Land North of The Grange, Westergate Street 1825/DP102

7.2 Appendix B – Borehole Logs

SU 90 NW 72   9359 0501   **Westergate**   **Block G**

Surface level +10.8 m
Water struck at +7.8 m
September 1981

Overburden	2.2 m
Mineral	3.8 m
Bedrock	0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Brickearth	Silt, brown	0.4	0.7
	Clay, silty, brown, with a few pebbles near base	1.5	2.2
Head Gravel	a 'Very clayey' gravel Gravel: fine with coarse, angular to subrounded; flint, some white and porous Sand: coarse with fine and medium Fines: clay	0.8	3.0
Raised Beach Deposits (younger)	b 'Clayey' pebbly sand Gravel: coarse and fine, angular to subrounded; flint, some white and porous Sand: fine with traces of medium and coarse; quartz Fines: silt, brown	2.0	5.0
	c Sandy gravel Gravel: fine and coarse, angular to well rounded; flint (some white and porous), chalk and other rock fragments Sand: fine with coarse and medium; quartz	1.0	6.0
London Clay	Clay, stiff, dark olive grey with a few rounded flint pebbles	0.8+	6.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 -64	+64 mm
a	37	17	46	2.2-3.0	37	5	4	8	29	17	0
b	15	79	6	3.0-4.0	15	70	1	1	6	7	0
				4.0-5.0	15	84	1	0	0	0	0
				Mean	**15**	**77**	**1**	**1**	**3**	**3**	**0**
c	3	56	41	5.0-6.0	3	41	7	8	19	22	0
b+c	**11**	**72**	**17**	**3.0-6.0**	**11**	**66**	**3**	**3**	**8**	**9**	**0**
a+b+c	**16**	**60**	**24**	**2.2-6.0**	**16**	**53**	**3**	**4**	**13**	**11**	**0**

7.3 Appendix C – Groundwater Monitoring and Soakage Testing Report

GROUNDWATER MONITORING

AT

SITE ADJACENT TO THE GRANGE, WESTERGATE

FOR

DEBORAH AND CHRISTOPHER BLOWS

SITE RECORDS

G6625

20 February 2025

Ground Management Ltd

Civil and Geotechnical Engineering Services

DOCUMENT CONTROL

Report Title: G6625 Site Adjacent to The Grange, Westergate Groundwater Monitoring

Report No./ Issue: G6625-01/1

Report Status: Issued for Client Comment

Distribution: Deborah & Christopher Blows PDF copy 20 February 2025

Prepared by: Alistair Tyler BSc MSc DIC CEng MICE

Signed:

Ground Management Ltd Robin Hill Farm Clay Lane Fishbourne Chichester West Sussex PO18 8AB

Phone/Fax [redacted]

CONTENTS

1.0 INTRODUCTION

1.1 Ground Management Ltd have carried out standpipe installation and provided support with groundwater monitoring on the site adjacent to The Grange, Westergate, located as indicated on Figure 1.

1.2 The work included excavation of two boreholes referenced as BH1 and BH2 each to a depth of 3m at the locations indicated on Figure 2. Copies of the typed exploratory hole logs are attached.

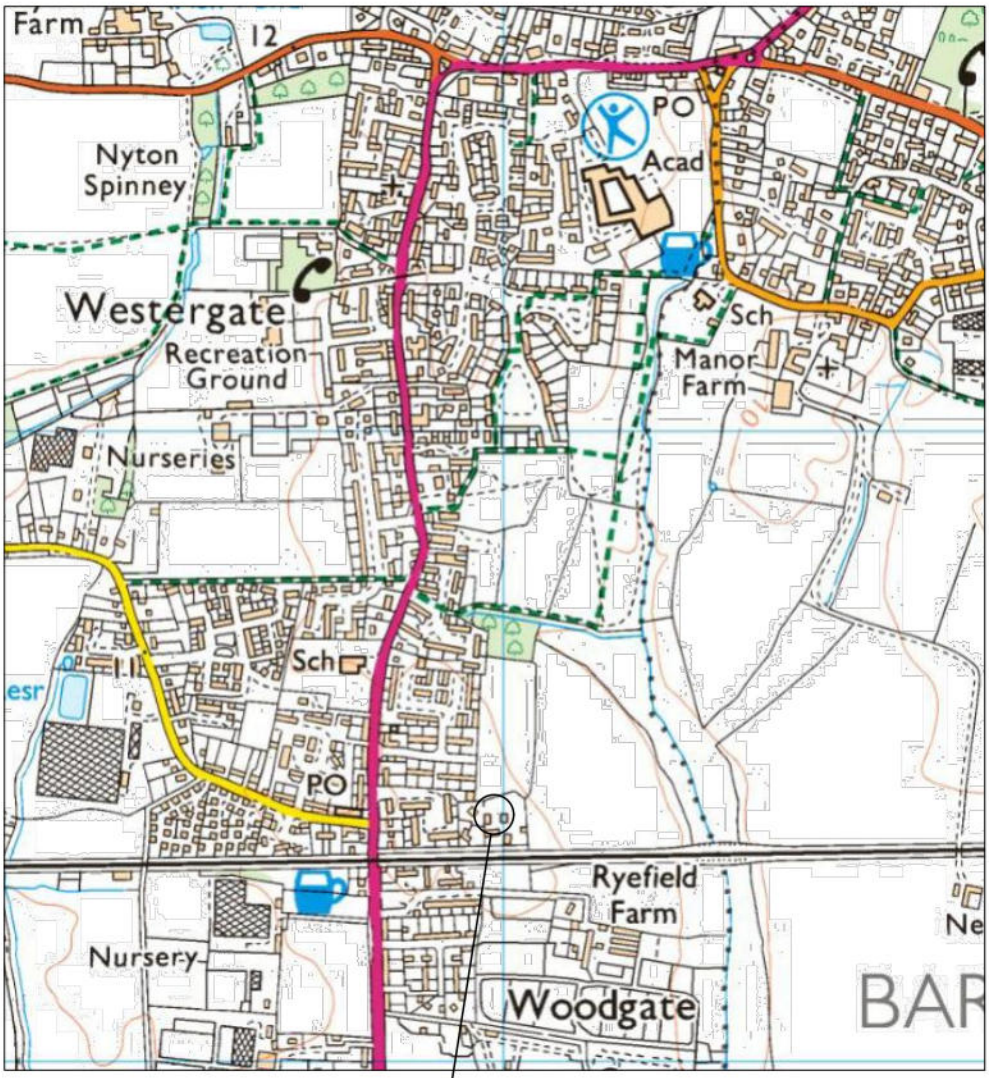
1.3 A dynamic probe (DPSH) referenced as DP2 was driven adjacent to BH2 to help assess the condition of the soil strata. The probe test results are appended.

1.4 Groundwater levels have been recorded with the assistance of the Client during regular monitoring since installation on 3/12/24. A copy of the recorded observations is appended. Monitoring will continue to the end of March 2025.

1.5 The work was carried out for Deborah and Christopher Blows and nothing in this report confers or purports to confer on any third party, any benefit or any right to enforce any term of this report pursuant to the Contract (Rights of Third Parties) Act 1999.

Ground Management Ltd Civil and Geotechnical Engineering Services	Robin Hill Farm Clay Lane Fishbourne CHICHESTER, West Sussex PO18 8AB [redacted]	PROJECT NO:	G6625
		FIGURE REF:	Figure 1
PROJECT:	Site Adjacent to The Grange, Westergate	PREPARED:	AJHT
SECTION:	Standpipe Installation	CHECKED:	AJHT
TITLE:	Site Location Plan	DATE:	Feb 2025

North
(Not to scale)



Ground Management Ltd Civil and Geotechnical Engineering Services	Robin Hill Farm Clay Lane Fishbourne CHICHESTER, West Sussex PO18 8AB [redacted]	PROJECT NO:	G6625
		FIGURE REF:	Figure 2
PROJECT:	Site Adjacent to The Grange, Westergate	PREPARED:	AJHT
SECTION:	Standpipe Installation	CHECKED:	AJHT
TITLE:	Exploratory Hole Location Plan	DATE:	Feb 2025

Exploratory hole locations are indicative only unless dimensioned

North

Based on Google Maps Image

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB
[redacted]

Site Site Adjacent to The Grange, Westergate			**Number** **BH1**
Excavation Method Dynamic (windowless) sampling using Archway Dart	**Dimensions** 80mm to 1.00m 70mm to 2.00m 60mm to 3.00m	**Ground Level (mOD)**	**Client** Deborah & Christopher Blows	**Job Number** G6625
	Location See Location Plan	**Dates** 01/01/2025	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Grass over moist brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little coarse medium and fine subangular to subrounded flint gravel. Occasional glass fragments		
					0.30	Soft to firm becoming firm orange brown silty CLAY with occasional coarse medium and fine subangular flint gravel. Occasional fine root up to 2mm dia.		
0.80-1.00	D1		HV at 0.8m : 30, 30, 30 kPa		(0.90)			
1.20-1.60	D2				1.20	Firm orange brown mottled grey silty CLAY with a little coarse medium and fine angular to subangular flint gravel.		
			HV at 1.5m : 45, 50, 50 kPa		(0.40)			
1.60-2.00	D3				1.60	Yellow brown slightly silty fine to medium SAND		
					(1.40)			
					3.00	Complete at 3.00m		

Remarks
Borehole remained open during excavation
Some seepage with groundwater rising to 0.9m below ground level 1hr after excavation
19mm dia.standpipe installed on completion - 2m slotted with geosoc and gravel surround, then plain with bentonite pellet seal

Scale (approx)	Logged By
1:20	AT

Figure No.
G6625.BH1

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB
[redacted]

Site
Site Adjacent to The Grange, Westergate

Number
BH2

Excavation Method
Dynamic (windowless) sampling using Archway Dart

Dimensions
80mm to 1.00m
70mm to 2.00m
60mm to 3.00m

Ground Level (mOD)

Client
Deborah & Christopher Blows

Job Number
G6625

Location
See Location Plan

Dates
01/01/2025

Engineer

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Grass over moist brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little medium and fine subangular to subrounded flint gravel.		
					(0.30)	MADE GROUND of coarse medium and fine subangular to subrounded flint gravel with some firm brown sandy clay / silt		
			HV at 0.8m : 40, 40, 40 kPa		0.40 (1.20)	Soft to firm becoming firm brown mottled red brown silty CLAY with occasional medium and fine subangular flint gravel.		
			HV at 1.5m : 45,50, 55 kPa		1.60 (1.40)	Wet yellow brown slightly silty fine to medium SAND		
					3.00	Complete at 3.00m		

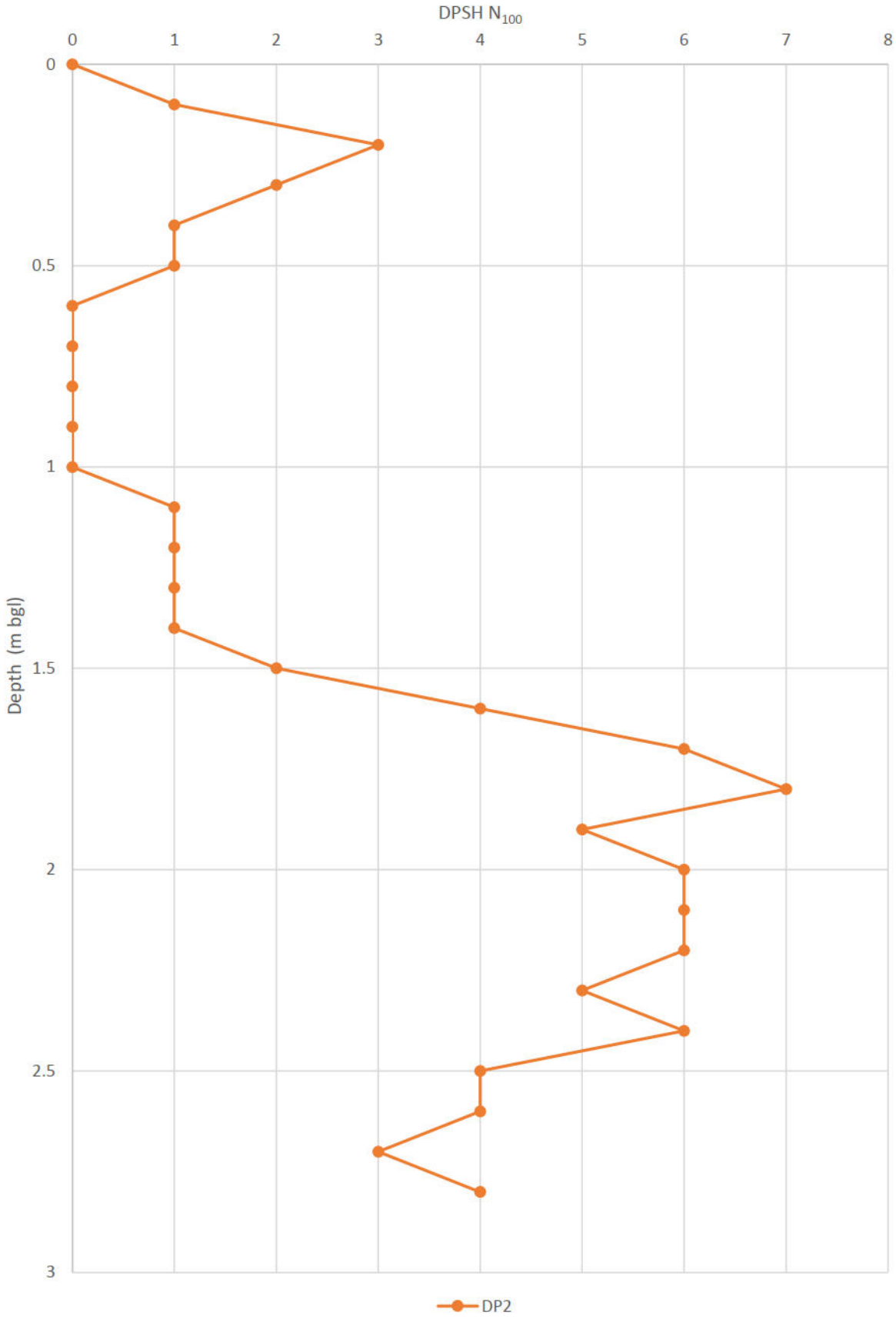
Remarks
Borehole remained open during excavation
Some seepage with groundwater rising to 0.95m below ground level 1hr after excavation
19mm dia.standpipe installed on completion - 2m slotted with geosoc and gravel surround, then plain with bentonite pellet seal
Dynamic probe (super heavy) driven adjacent to borehole - results on separate sheet

Scale (approx)
1:20

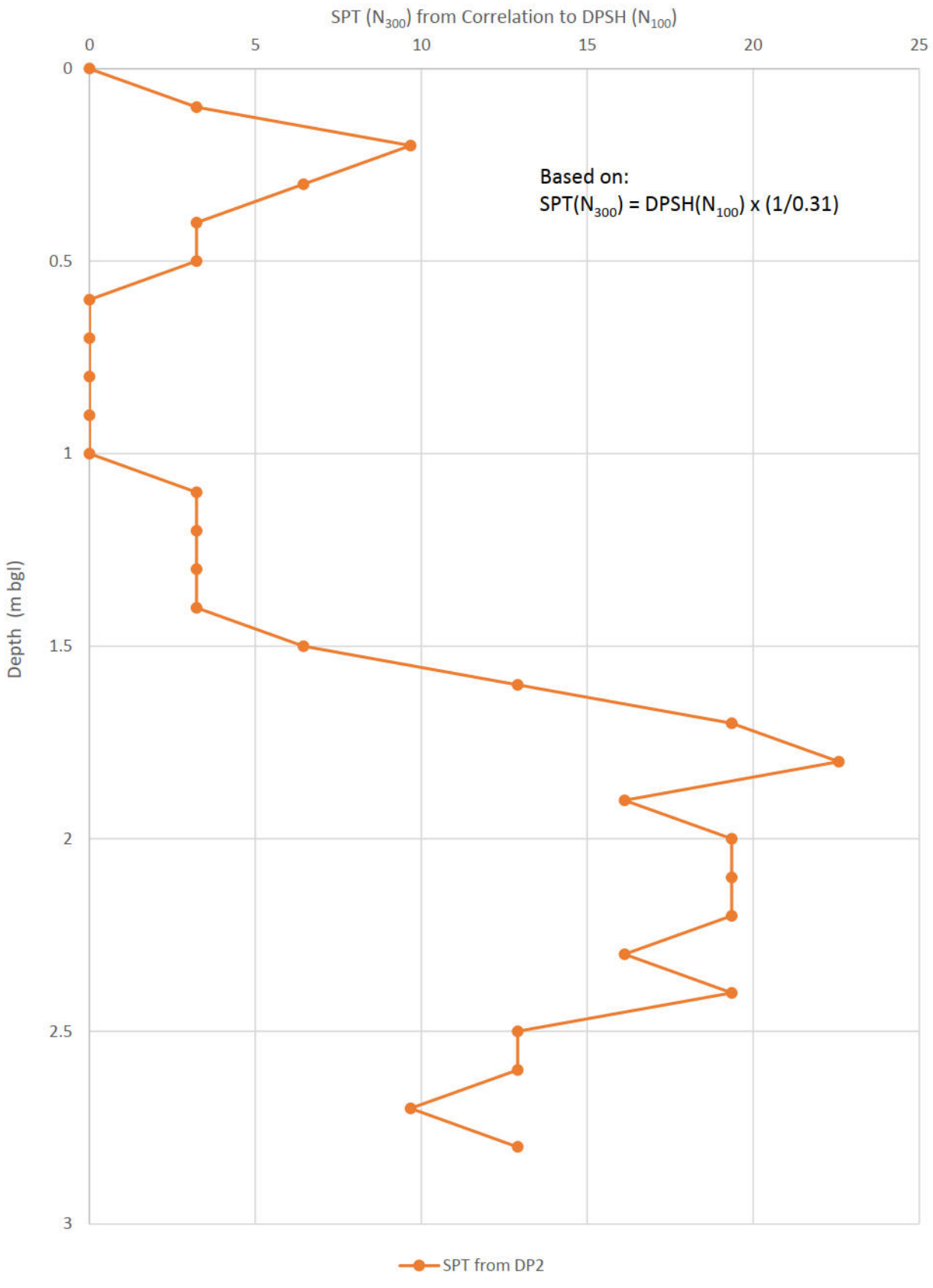
Logged By
AT

Figure No.
G6625.BH2

Ground Management Ltd
Site Adjacent to The Grange, Westergate
Dynamic Probe DPSH Results (DP2)



Ground Management Ltd
Site Adjacent to The Grange, Westergate
Dynamic Probe DPSH Results (DP2)
Correlated to SPT



Project No: G6625

Site adjacent to The Grange, Westergate

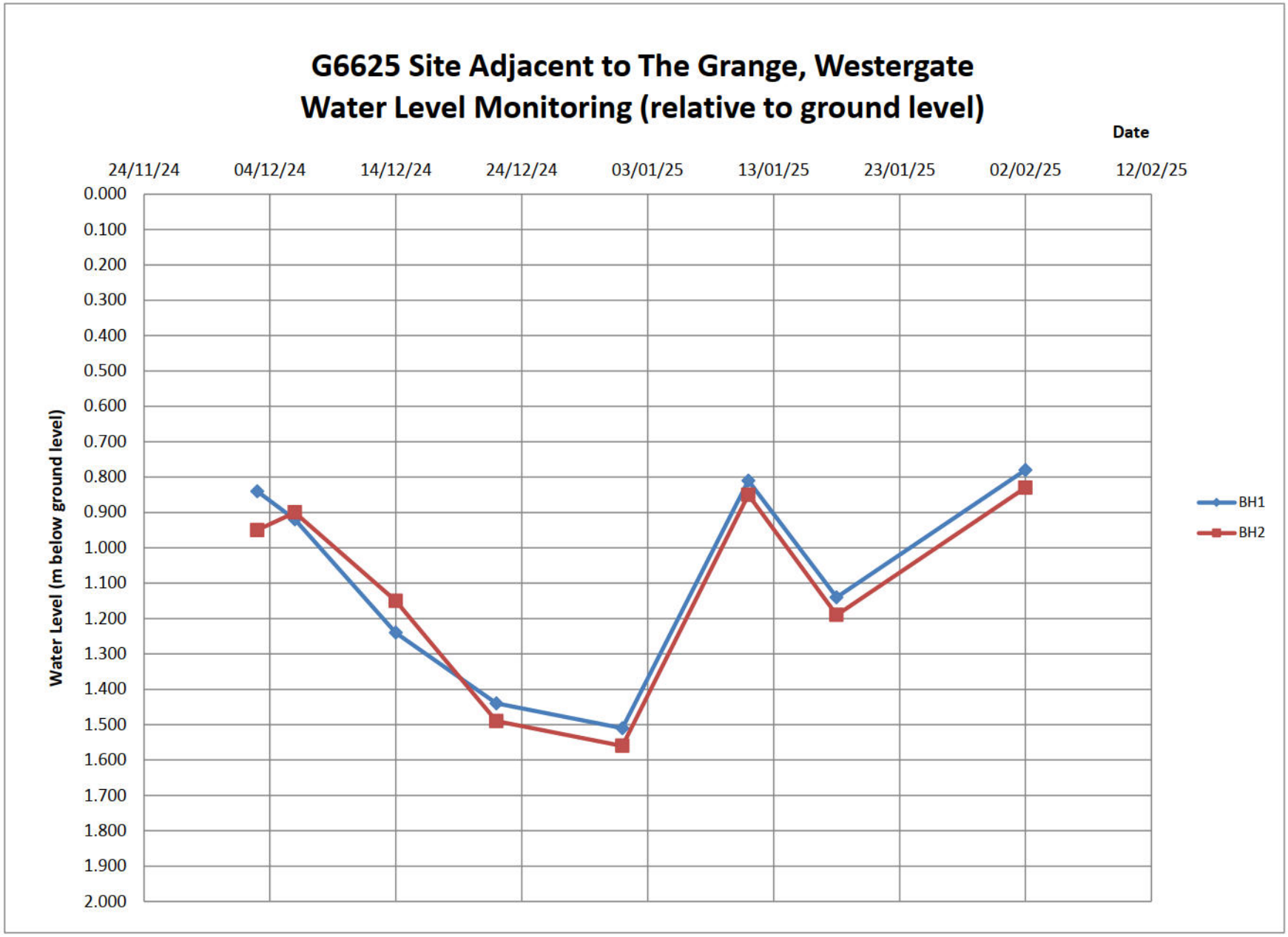
02-Feb-25

	BH1	BH2			
Upstand (m)	0.400	0.400			
Ground Level (mAOD)					
Cover level (mAOD)	0.400	0.400			
Base dip (m)					

mAOD: metres Above Ordnance Datum

Ground levels estimated by reference to survey (Not available)

	Dip from top of standpipe cover					Water level below ground level (m)					Water level (mAOD)			
Date	**BH1**	**BH2**				**BH1**	**BH2**				**BH1**	**BH2**		**Weather**
03/12/24	1.3	1.35				0.840	0.950				-0.900			
06/12/24	1.32	1.3				0.920	0.900							
14/12/24	1.64	1.55				1.240	1.150							
22/12/24	1.84	1.89				1.440	1.490							
01/01/25	1.91	1.96				1.510	1.560							
11/01/25	1.21	1.25				0.810	0.850							
18/01/25	1.54	1.59				1.140	1.190							
02/02/25	1.18	1.23				0.780	0.830							


G6625 Site Adjacent to The Grange, Westergate
Water Level Monitoring (relative to ground level)
Date
24/11/24
04/12/24
14/12/24
24/12/24
03/01/25
13/01/25
23/01/25
02/02/25
12/02/25
Water Level (m below ground level)
0.000
0.100
0.200
0.300
0.400
0.500
0.600
0.700
0.800
0.900
1.000
1.100
1.200
1.300
1.400
1.500
1.600
1.700
1.800
1.900
2.000
BH1
BH2

GROUNDWATER MONITORING AND SOAKAGE TESTING

AT

SITE ADJACENT TO THE GRANGE, WESTERGATE

FOR

DEBORAH AND CHRISTOPHER BLOWS

G6625

02 May 2025

Ground Management Ltd

Civil and Geotechnical Engineering Services

DOCUMENT CONTROL

Report Title: G6625 Site Adjacent to The Grange, Westergate
Groundwater Monitoring and Soakage Testing

Report No./ Issue: G6625-02/1

Report Status: Issued for Client Comment

Distribution: Deborah & Christopher Blows PDF copy 02 May 2025

Prepared by: Alistair Tyler BSc MSc DIC CEng MICE

Signed:

Ground Management Ltd Robin Hill Farm Clay Lane Fishbourne Chichester West Sussex PO18 8AB

Phone/Fax [redacted]

CONTENTS

1.0 INTRODUCTION

1.1 Ground Management Ltd have carried out standpipe installation and provided support with groundwater monitoring and soakage testing on the site adjacent to The Grange, Westergate, located as indicated on Figure 1.

1.2 The work included excavation of two boreholes referenced as BH1 and BH2 each to a depth of 3m at the locations indicated on Figure 2. A 19mm diameter standpipe was installed in each completed borehole to allow monitoring of groundwater levels.

1.3 A dynamic probe (DPSH) referenced as DP2 was driven adjacent to BH2 to help assess the condition of the soil strata. The probe test results are appended.

1.4 Groundwater levels have been recorded with the assistance of the Client during regular monitoring from installation on 3/12/24 to final readings on 30/3/25. A copy of the recorded observations is appended.

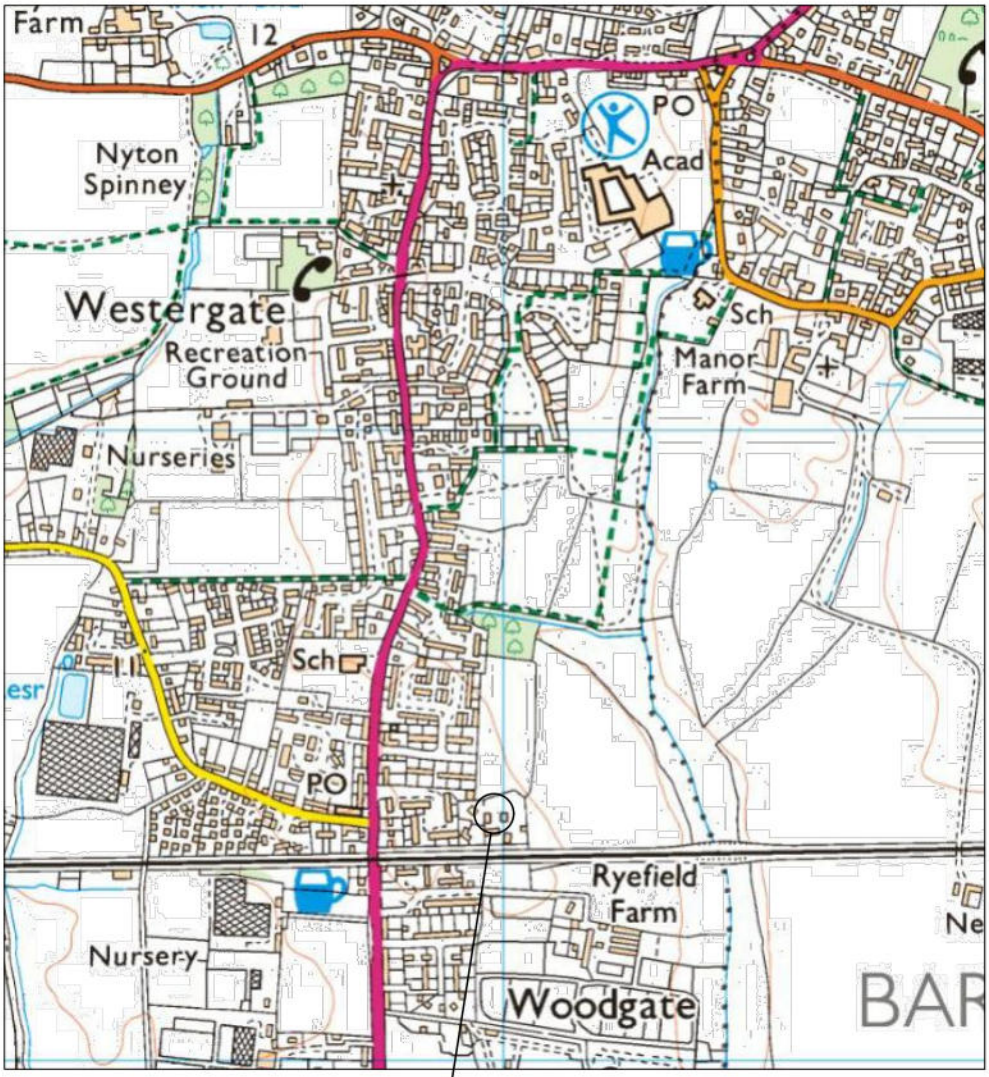
1.5 Following an initial period of groundwater monitoring a return visit was made on 31/3/25 to set up soakage testing within a hand dug trial pit referenced as TP1. The testing comprised 3 fills of the pit in accordance with BRE365 and continued to 2/4/25. A summary of the results and derived infiltration coefficients is attached together with the plotted test data. The pit was subsequently backfilled.

1.6 Copies of the typed exploratory hole logs are attached.

1.7 The work was carried out for Deborah and Christopher Blows and nothing in this report confers or purports to confer on any third party, any benefit or any right to enforce any term of this report pursuant to the Contract (Rights of Third Parties) Act 1999.

Ground Management Ltd Civil and Geotechnical Engineering Services	Robin Hill Farm Clay Lane Fishbourne CHICHESTER West Sussex PO18 8AB [redacted]	PROJECT NO:	G6625
		FIGURE REF:	Figure 1
PROJECT:	Site Adjacent to The Grange, Westergate	PREPARED:	AJHT
SECTION:	Groundwater Monitoring and Soakage Testing	CHECKED:	AJHT
TITLE:	Site Location Plan	DATE:	Mar 2025

North
(Not to scale)



Site Location

Ground Management Ltd Civil and Geotechnical Engineering Services	Robin Hill Farm Clay Lane Fishbourne CHICHESTER, West Sussex PO18 8AB [redacted]	PROJECT NO:	G6625
		FIGURE REF:	Figure 2
PROJECT:	Site Adjacent to The Grange, Westergate	PREPARED:	AJHT
SECTION:	Groundwater Monitoring and Soakage Testing	CHECKED:	AJHT
TITLE:	Exploratory Hole Location Plan	DATE:	Mar 2025

Exploratory hole locations are indicative only unless dimensioned

North

Based on Google Maps Image

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB
[redacted]
[redacted]

Site	Number
Site Adjacent to The Grange, Westergate	BH1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic (windowless) sampling using Archway Dart	80mm to 1.00m 70mm to 2.00m 60mm to 3.00m		Deborah & Christopher Blows	G6625
	Location See Location Plan	**Dates** 01/01/2025	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Grass over moist brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little coarse medium and fine subangular to subrounded flint gravel. Occasional glass fragments		
					0.30	Soft to firm becoming firm orange brown silty CLAY with occasional coarse medium and fine subangular flint gravel. Occasional fine root up to 2mm dia.		
0.80-1.00	D1		HV at 0.8m : 30, 30, 30 kPa		(0.90)			
1.20-1.60	D2				1.20	Firm orange brown mottled grey silty CLAY with a little coarse medium and fine angular to subangular flint gravel.		
			HV at 1.5m : 45, 50, 50 kPa		(0.40)			
1.60-2.00	D3				1.60	Yellow brown slightly silty fine to medium SAND		
					(1.40)			
					3.00	Complete at 3.00m		

Remarks
Borehole remained open during excavation
Some seepage with groundwater rising to 0.9m below ground level 1hr after excavation
19mm dia.standpipe installed on completion - 2m slotted with geosoc and gravel surround, then plain with bentonite pellet seal

Scale (approx)	Logged By
1:20	AT

Figure No. G6625.BH1

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB
[redacted]
[redacted]

Site Site Adjacent to The Grange, Westergate			**Number** **BH2**
Excavation Method Dynamic (windowless) sampling using Archway Dart	**Dimensions** 80mm to 1.00m 70mm to 2.00m 60mm to 3.00m	**Ground Level (mOD)**	**Client** Deborah & Christopher Blows	**Job Number** G6625
	Location See Location Plan	**Dates** 01/01/2025	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Grass over moist brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little medium and fine subangular to subrounded flint gravel.		
					(0.30)	MADE GROUND of coarse medium and fine subangular to subrounded flint gravel with some firm brown sandy clay / silt		
			HV at 0.8m : 40, 40, 40 kPa		0.40 (1.20)	Soft to firm becoming firm brown mottled red brown silty CLAY with occasional medium and fine subangular flint gravel.		
			HV at 1.5m : 45,50, 55 kPa		1.60 (1.40)	Wet yellow brown slightly silty fine to medium SAND		
					3.00	Complete at 3.00m		

Remarks
Borehole remained open during excavation
Some seepage with groundwater rising to 0.95m below ground level 1hr after excavation
19mm dia.standpipe installed on completion - 2m slotted with geosoc and gravel surround, then plain with bentonite pellet seal
Dynamic probe (super heavy) driven adjacent to borehole - results on separate sheet

Scale (approx)	Logged By
1:20	AT

Figure No.
G6625.BH2

Ground Management Ltd

Civil and Geotechnical Engineering Services

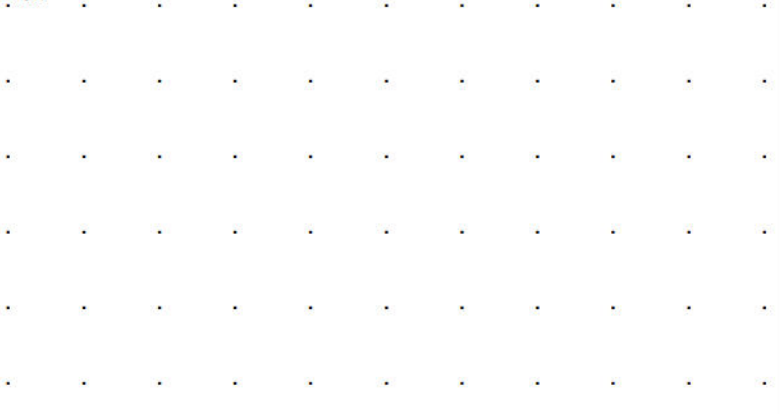
Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB
[redacted]
[redacted]

Site	Trial Pit Number
Site Adjacent to The Grange, Westergate	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand dug	0.3 x 0.55		Deborah & Christopher Blows	G6625
	Location	**Dates**	**Engineer**	**Sheet**
	See Location Plan	31/03/2025-02/04/2025		1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Grass over slightly moist dark brown slightly sandy slightly clayey silt with some coarse medium and fine subangular flint gravel and occasional brick and concrete fragement up to cobble size. Reworked TOPSOIL/made ground, possible relic topsoil at base of stratum		
					0.50 (0.10) 0.60	Firm orange brown silty CLAY		
						Complete at 0.60m		

Plan

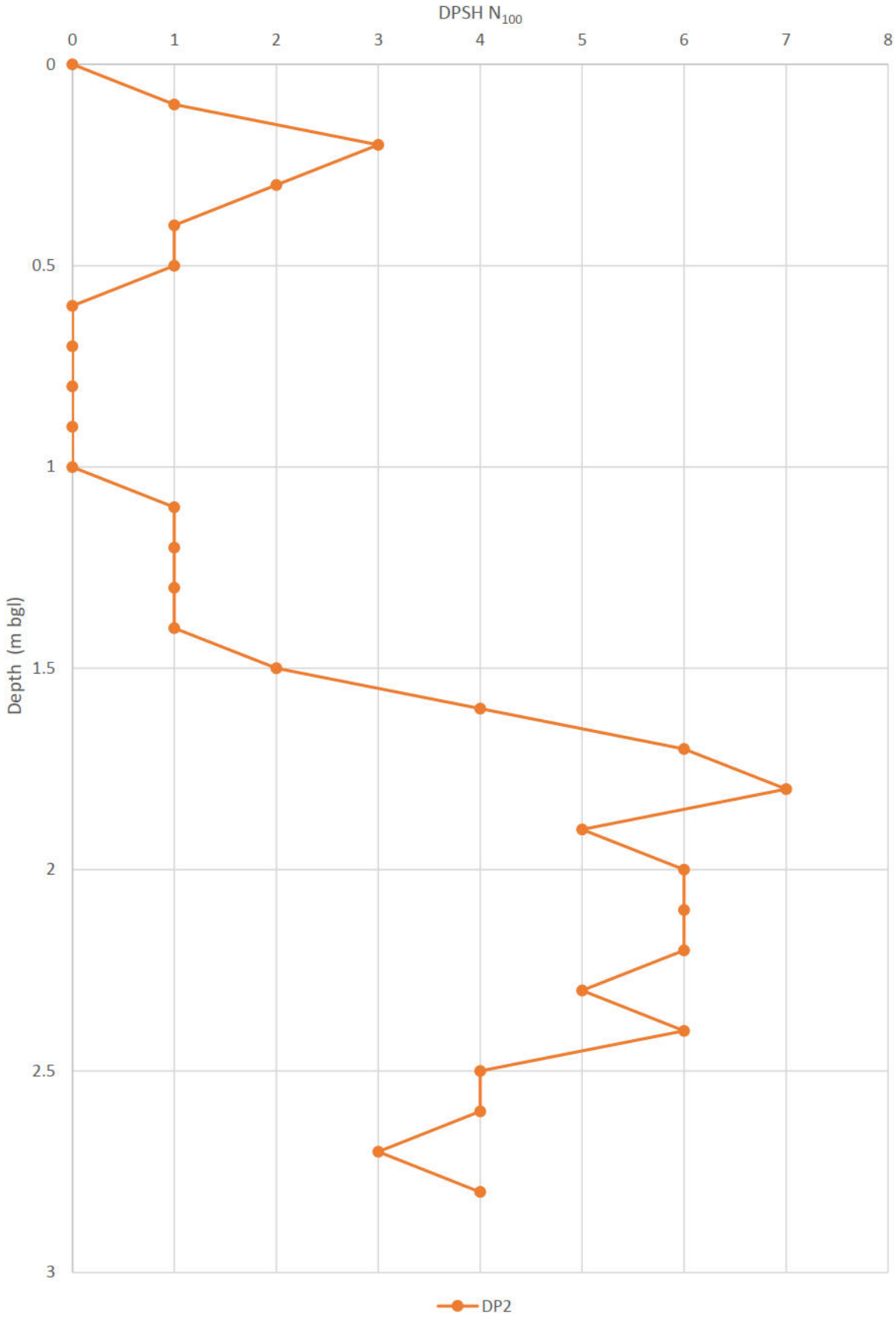


Remarks

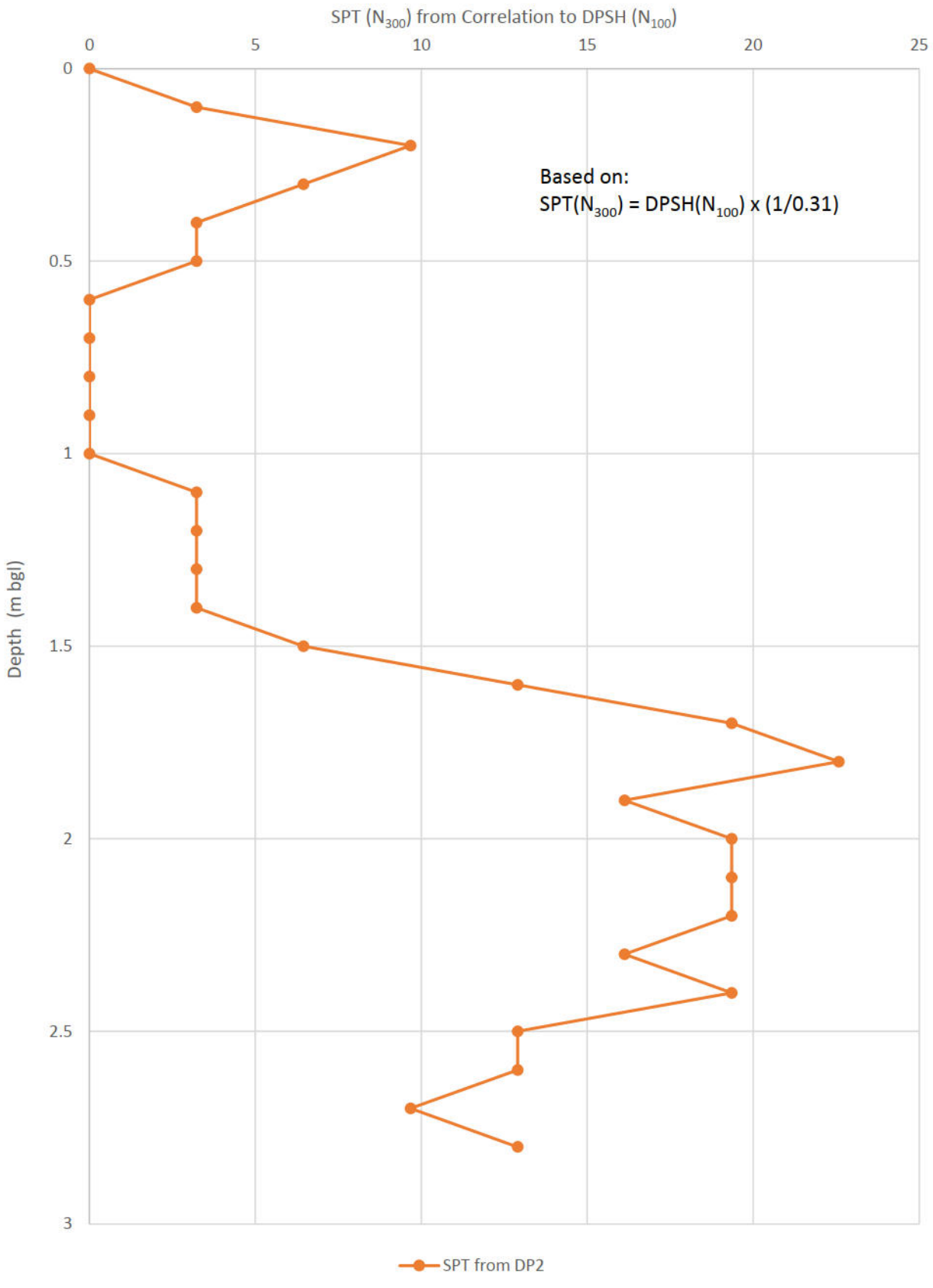
Pit sides stable and vertical during excavation
Groundwater was not encountered

Scale (approx)	Logged By	Figure No.
1:10	AT	G6625.TP1

Ground Management Ltd
Site Adjacent to The Grange, Westergate
Dynamic Probe DPSH Results (DP2)



Ground Management Ltd
Site Adjacent to The Grange, Westergate
Dynamic Probe DPSH Results (DP2)
Correlated to SPT



G6625 Site Adj. to The Grange, Westergate

Soakage Test Results Summary

Trial Pit	Pit Dimensions LxWxD (metres)	Test No.	Water Level at start of test (mm below ground level)	Duration of test (mins)	Fall of water level during test (mm)	Infiltration Coefficient (m/s) (see note)
TP1	0.3 x 0.5 x 0.6	1	75	235	482	1.11×10^{-5}
		2	70	618	430	3.04×10^{-6}
		3	65	588	475	3.34×10^{-6}

G6625 Site Adjacent to The Grange, Westergate

Soakage Test

TP1 Test 1

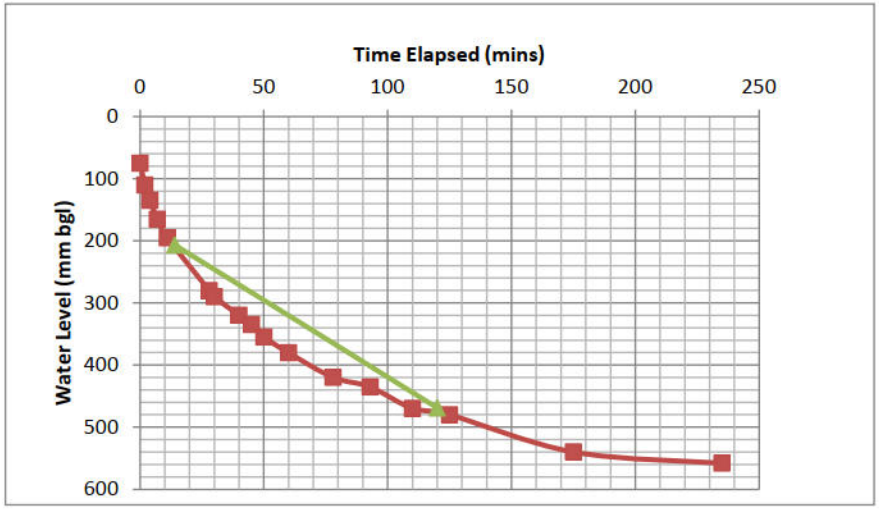
Test Start Date: 31-Mar-25

Dimensions (m): width = 0.30 length = 0.55 depth = 0.60

Date	Time	Date and time	Elapsed	Dip	End Fit
31/03/2025	16:50	31/03/2025 16:50	start	dry	
31/03/2025	16:52:00	31/03/2025 16:52	0	75	
31/03/2025	16:54:00	31/03/2025 16:54	2	110	
31/03/2025	16:56:00	31/03/2025 16:56	4	135	
31/03/2025	16:59:00	31/03/2025 16:59	7	165	
31/03/2025	17:03:00	31/03/2025 17:03	11	195	
31/03/2025	17:20	31/03/2025 17:20	28	280	
31/03/2025	17:22:00	31/03/2025 17:22	30	290	
31/03/2025	17:32:00	31/03/2025 17:32	40	320	
31/03/2025	17:37:00	31/03/2025 17:37	45	335	
31/03/2025	17:42:00	31/03/2025 17:42	50	355	
31/03/2025	17:52:00	31/03/2025 17:52	60	380	
31/03/2025	18:10:00	31/03/2025 18:10	78	420	
31/03/2025	18:25:00	31/03/2025 18:25	93	435	
31/03/2025	18:42:00	31/03/2025 18:42	110	470	
31/03/2025	18:57:00	31/03/2025 18:57	125	480	
31/03/2025	19:47:00	31/03/2025 19:47	175	540	
31/03/2025	20:47:00	31/03/2025 20:47	235	558	

Weather

mainly dry
sunny
spells



0

0 Projected

		Time (mins)
t0	75	
t25	206.25	14
t50	337.5	
t75	468.75	120
t100	600	
fall		0.525
t25 - t75		0.2625
Area t50		0.61125

Infiltration Coefficient = 1.11E-05 m/s

G6625 Site Adjacent to The Grange, Westergate

Soakage Test

TP1 Test 2

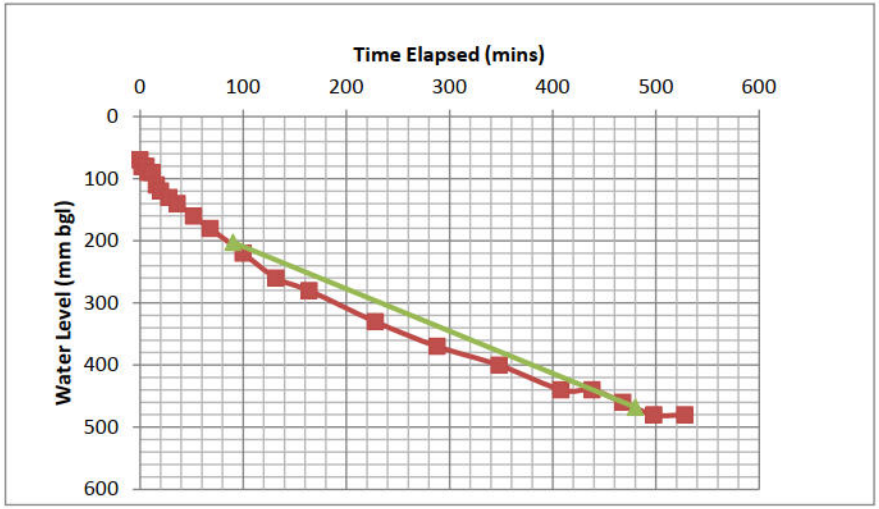
Test Start Date: 01-Apr-25

Dimensions (m): width = 0.30 length = 0.55 depth = 0.60

Date	Time	Date and time	Elapsed	Dip	End Fit
01/04/2025	08:00	01/04/2025 08:00	start	dry	
01/04/2025	08:02:00	01/04/2025 08:02	0	70	
01/04/2025	08:04:00	01/04/2025 08:04	2	80	
01/04/2025	08:06:00	01/04/2025 08:06	4	80	
01/04/2025	08:08:00	01/04/2025 08:08	6	80	
01/04/2025	08:10:00	01/04/2025 08:10	8	90	
01/04/2025	08:14	01/04/2025 08:14	12	90	
01/04/2025	08:18:00	01/04/2025 08:18	16	110	
01/04/2025	08:22:00	01/04/2025 08:22	20	120	
01/04/2025	08:30:00	01/04/2025 08:30	28	130	
01/04/2025	08:38:00	01/04/2025 08:38	36	140	
01/04/2025	08:54:00	01/04/2025 08:54	52	160	
01/04/2025	09:10:00	01/04/2025 09:10	68	180	
01/04/2025	09:42	01/04/2025 09:42	100	220	
01/04/2025	10:14:00	01/04/2025 10:14	132	260	
01/04/2025	10:46:00	01/04/2025 10:46	164	280	
01/04/2025	11:50:00	01/04/2025 11:50	228	330	
01/04/2025	12:50:00	01/04/2025 12:50	288	370	
01/04/2025	13:50:00	01/04/2025 13:50	348	400	
01/04/2025	14:50:00	01/04/2025 14:50	408	440	
01/04/2025	15:20:00	01/04/2025 15:20	438	440	
01/04/2025	15:50	01/04/2025 15:50	468	460	
01/04/2025	16:20	01/04/2025 16:20	498	480	
01/04/2025	16:50	01/04/2025 16:50	528	480	
01/04/2025	18:20	01/04/2025 18:20	618	500	

Weather

mainly dry
sunny
spells



	Time (mins)	
t0	70	
t25	202.5	90
t50	335	
t75	467.5	480
t100	600	
	fall	0.53
	t25 - t75	0.265
	Area t50	0.6155

0

0 Projected

Infiltration Coefficient = 3.04E-06 m/s

G6625 Site Adjacent to The Grange, Westergate
Soakage Test

TP1 Test 3

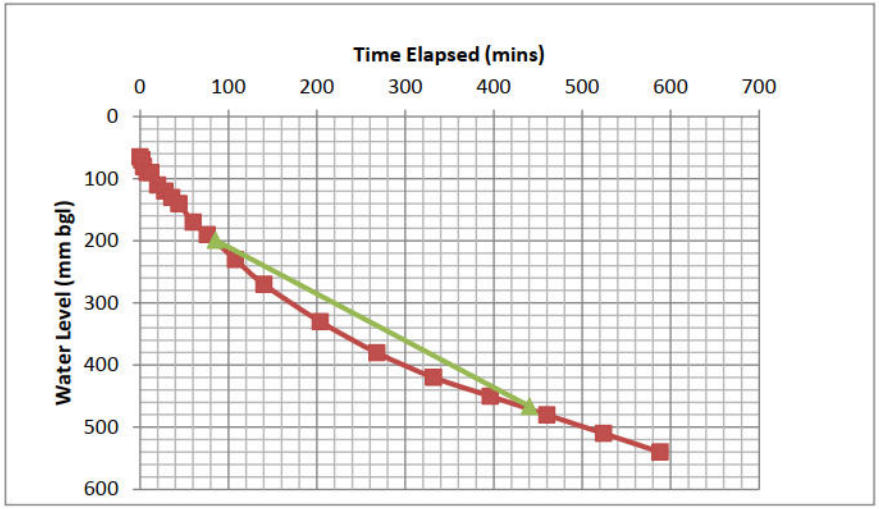
Test Start Date: 02-Apr-25

Dimensions (m): width = 0.30 length = 0.55 depth = 0.60

Date	Time	Date and time	Elapsed	Dip	End Fit
02/04/2025	07:59	02/04/2025 07:59	start	wet	
02/04/2025	08:00:00	02/04/2025 08:00	0	65	
02/04/2025	08:02:00	02/04/2025 08:02	2	70	
02/04/2025	08:04:00	02/04/2025 08:04	4	80	
02/04/2025	08:08:00	02/04/2025 08:08	8	90	
02/04/2025	08:12:00	02/04/2025 08:12	12	90	
02/04/2025	08:20	02/04/2025 08:20	20	110	
02/04/2025	08:28:00	02/04/2025 08:28	28	120	
02/04/2025	08:36:00	02/04/2025 08:36	36	130	
02/04/2025	08:44:00	02/04/2025 08:44	44	140	
02/04/2025	09:00:00	02/04/2025 09:00	60	170	
02/04/2025	09:16:00	02/04/2025 09:16	76	190	
02/04/2025	09:48:00	02/04/2025 09:48	108	230	
02/04/2025	10:20:00	02/04/2025 10:20	140	270	
02/04/2025	11:24:00	02/04/2025 11:24	204	330	
02/04/2025	12:28:00	02/04/2025 12:28	268	380	
02/04/2025	13:32:00	02/04/2025 13:32	332	420	
02/04/2025	14:36:00	02/04/2025 14:36	396	450	
02/04/2025	15:40:00	02/04/2025 15:40	460	480	
02/04/2025	16:44	02/04/2025 16:44	524	510	
02/04/2025	17:48	02/04/2025 17:48	588	540	

Weather

mainly dry
sunny
spells



	Time (mins)	
t0	65	
t25	198.75	85
t50	332.5	
t75	466.25	440
t100	600	
fall		0.535
t25 - t75		0.2675
Area t50		0.61975

0
0 Projected

Infiltration Coefficient = 3.34E-06 m/s

Project No: G6625

Site adjacent to The Grange, Westergate

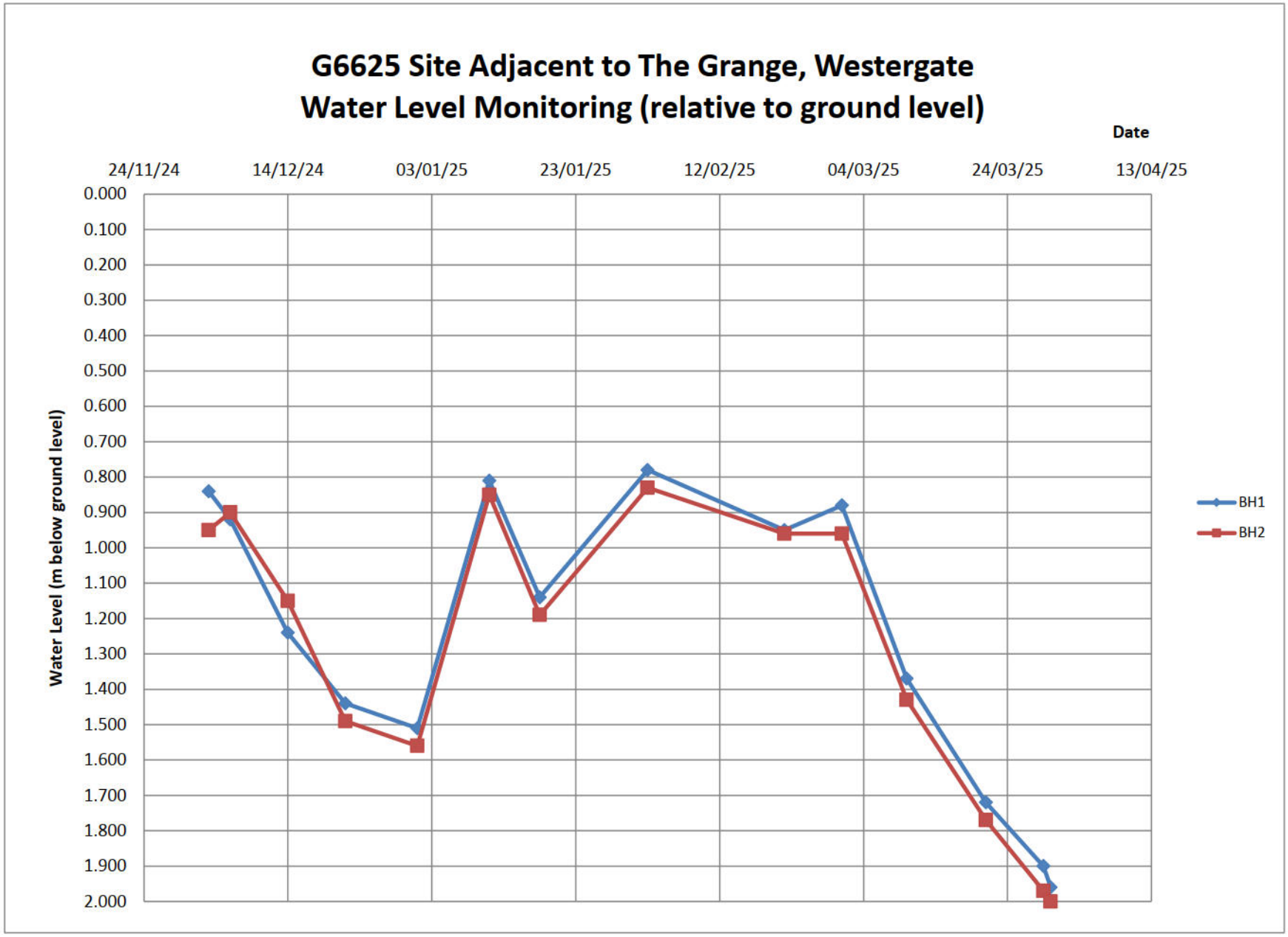
30-Mar-25

	BH1	BH2			
Upstand (m)	0.400	0.400			
Ground Level (mAOD)					
Cover level (mAOD)	0.400	0.400			
Base dip (m)					

mAOD: metres Above Ordnance Datum

Ground levels estimated by reference to survey (Not available)

	Dip from top of standpipe cover					Water level below ground level (m)					Water level (mAOD)			
Date	**BH1**	**BH2**				**BH1**	**BH2**				**BH1**	**BH2**		**Weather**
03/12/24	1.3	1.35				0.840	0.950				-0.900			
06/12/24	1.32	1.3				0.920	0.900							
14/12/24	1.64	1.55				1.240	1.150							
22/12/24	1.84	1.89				1.440	1.490							
01/01/25	1.91	1.96				1.510	1.560							
11/01/25	1.21	1.25				0.810	0.850							
18/01/25	1.54	1.59				1.140	1.190							
02/02/25	1.18	1.23				0.780	0.830							
21/02/25	1.35	1.36				0.950	0.960							
01/03/25	1.28	1.36				0.880	0.960							Dry + Sunny. Heavy rain during previous week
10/03/25	1.77	1.83				1.370	1.430							
21/03/25	2.12	2.17				1.720	1.770							
29/03/25	2.3	2.37				1.900	1.970							
30/03/25	2.36	2.4				1.960	2.000							


G6625 Site Adjacent to The Grange, Westergate
Water Level Monitoring (relative to ground level)
Date
24/11/24
14/12/24
03/01/25
23/01/25
12/02/25
04/03/25
24/03/25
13/04/25
Water Level (m below ground level)
0.000
0.100
0.200
0.300
0.400
0.500
0.600
0.700
0.800
0.900
1.000
1.100
1.200
1.300
1.400
1.500
1.600
1.700
1.800
1.900
2.000
BH1
BH2

Photograph 1 : BH1 Location

Photograph 2 : BH1 Extracted Samples

Photograph 3 : BH2 Location

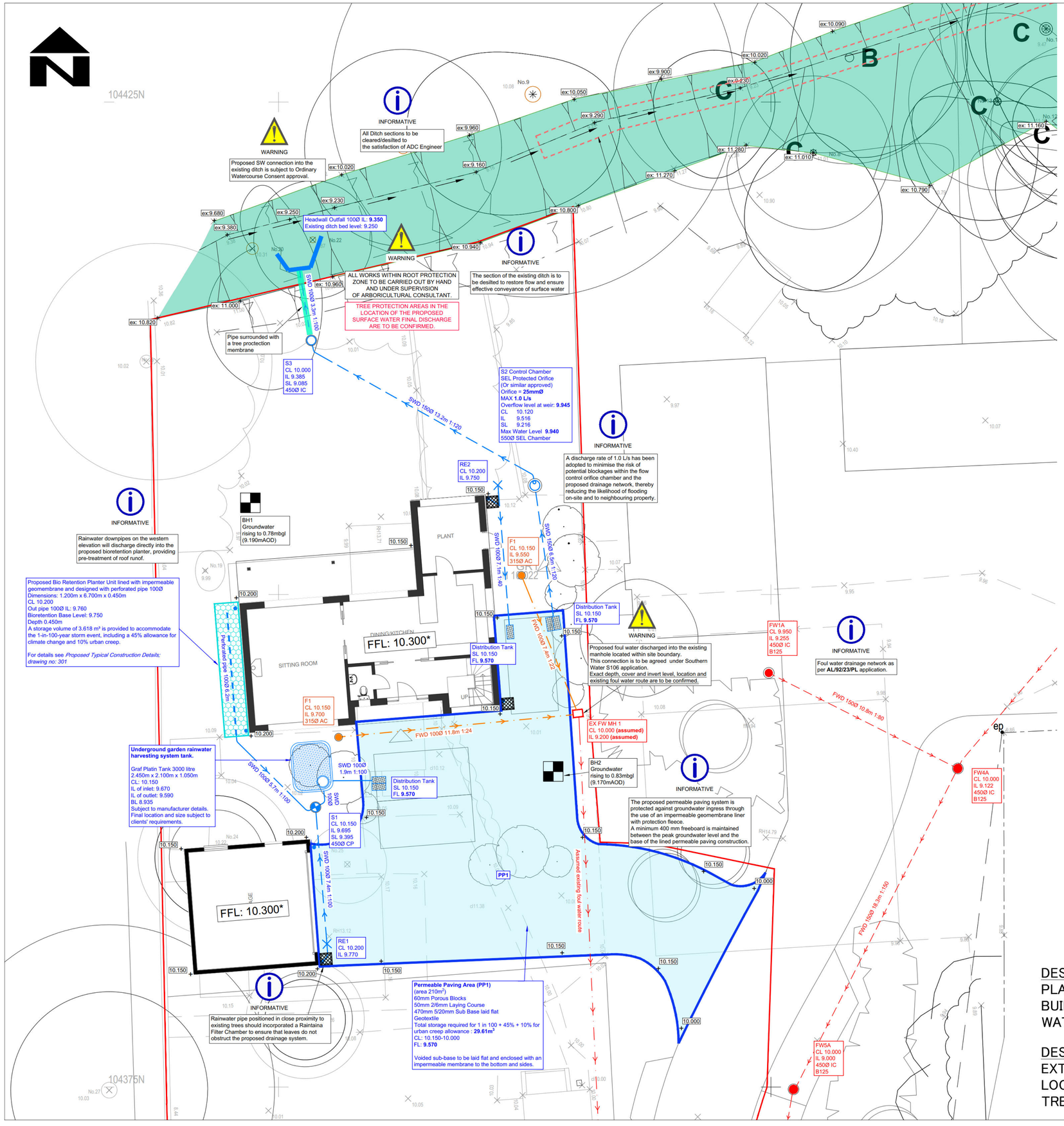
Photograph 4 : BH2 Extracted Samples

Photograph 1 : TP1 Excavation Location

Photograph 2 : TP1 Excavation

Photograph 3 : TP1 Arisings

7.4 **Appendix D – Proposed Drainage Strategy, Contributing Area Plan & Exceedance Flow Routes, Proposed Typical Construction Details and Hydraulic Calculations.**



DRAINAGE LEGEND

EXISTING FEATURES

- Existing foul water sewer/drain and manhole (information as taken from the site)
- Foul water drainage network as per application AL/92/23/PL

PROPOSED FEATURES

- Foul Drainage
- Surface Water Drainage
- Pipe crossing (thickening denotes pipe above)
- Storm water catchpit chamber (450Ø)
- Storm water orifice flow control chamber (500Ø)
- Rainwater pipe- assumed location, tbc
- Storm water rodding eye
- Extent of permeable paving with porous sub-base lined with impermeable membrane
- Proposed Bioretention Planter lined with an impermeable geomembrane
- Raintaina Filter Chamber
- Distribution tank
- Foul water access chamber (300Ø)
- Foul water inspection chamber (450Ø)
- Existing ditch flow direction
- Existing ditch desilting area
- ex:10.150 — Existing level
- 10.150 — Proposed surface level (indicative only for drainage purposes- tbc)
- 10.300* — Finished floor level (**assumed** and tbc- indicative only for drainage purposes)
- 100Ø 4.5m 1:100 Z BED — Pipe info - diameter, length, gradient, bedding type

ABBREVIATIONS

MH	- MANHOLE
IC	- INSPECTION CHAMBER
AC	- ACCESS CHAMBER
CP	- CATCHPIT
BC	- BRAKE CHAMBER
RE	- RODDING EYE
IL	- INVERT LEVEL
SL	- SUMP LEVEL
RA	- RESTRICTED ACCESS COVER
CL	- COVER LEVEL
TL	- TOP OF CELLULAR SA
BL	- BASE OF CELLULAR SA
FL	- FORMATION LEVEL

- Borehole locations (as taken from Groundwater Monitoring and Soakage Test report by Ground Management Ltd, dated 02.05.2025)
- Site Boundary (indicative)

Site Specific Notes

1. Proposed drainage designed based on desktop study, a groundwater monitoring and soakage test report, and all information provided from the site.
2. All storage volumes is designed to the critical 1 in 100 year storm event + 45% of climate change allowance + 10% for urban creep.
3. Due to the high groundwater level on site, surface water runoff from roof and driveway areas will be collected within the voided sub-base of the permeable paving and discharged into the existing ditch at a restricted flow rate of 1.0 L/s..
4. The bioretention planter is introduced to capture runoff at source, allowing for temporary storage.
5. Paving construction to Client's and manufacturer specification.
6. Proposed SW connection into the existing ditch is subject to OWC approval.
7. Foul water drainage is to be discharged into the existing foul water manhole located within the proposed site boundary, and then discharged into the Southern Water public sewer. This connection is to be agreed under S106 Application.

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DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL
WATER AUTHORITY

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
LOCATION AND DEPTH OF EXISTING UTILITIES
TREE PROTECTION AREAS

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
P1	06.11.25	UPDATED TO ADC REQUIREMENTS	MR	CS	CS
P-	10.06.25	PRELIMINARY ISSUE	MR	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT: DEBORAH AND CHRISTOPHER BLOWS

ARCHITECT: SMITH SIMMONS & PARTNERS

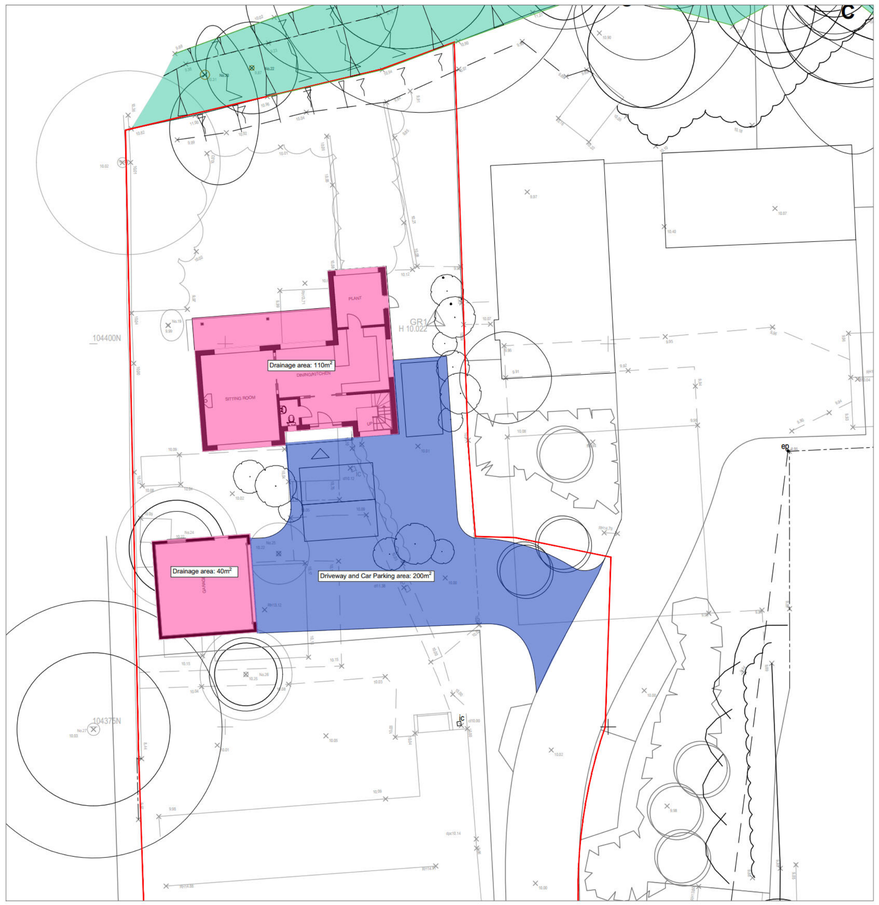
JOB TITLE: LAND NORTH OF THE GRANGE, WESTERGATE, PO20 3SQ

DRAWING TITLE: PROPOSED DRAINAGE STRATEGY

DRAWN	ENGINEER	CHECKED	APPROVED
MR	CS	CS	CS

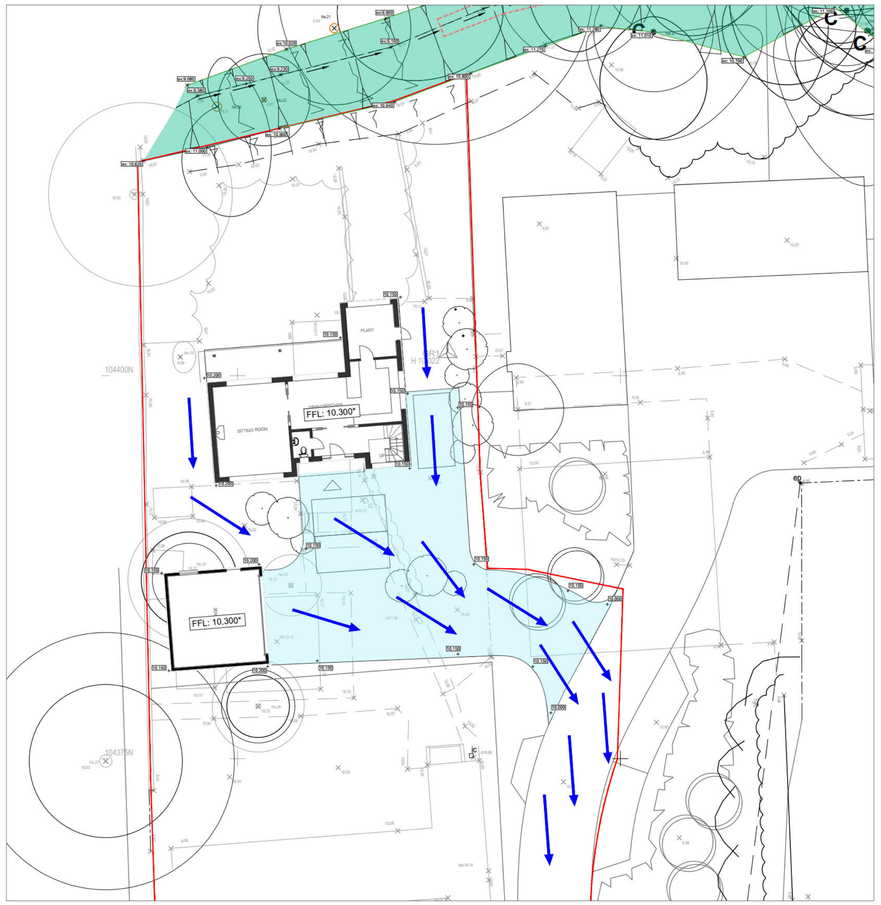
DATE	SCALE @ A1
JUNE 2025	1:100

JOB No.	STATUS	DRAWING No.	REV.
C3388	PL	101	P1



CONTRIBUTING AREA PLAN (scale 1:200)

Proposed Catchment	Drainage Area (ha)
Roof Area	0.0150 ha
Driveway and Parking Space	0.0200 ha
Total catchment areas included in the proposed calculations	**0.0350 ha**



EXCEEDANCE FLOW ROUTES (scale 1:200)

BLUE ARROWS SHOW ROUTE OF EXCEEDANCE FLOWS FROM PROJECTED POINTS OF EMERGENCE TOWARDS DIRECTION OF FALL.

ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%. EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER INTENSITY THAN THIS.

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Consulting Civil Engineers

CLIENT: DEBORAH AND CHRISTOPHER BLOWS

ARCHITECT: SMITH SIMMONS & PARTNERS

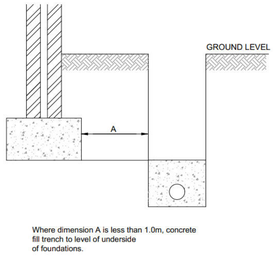
JOB TITLE: LAND NORTH OF THE GRANGE, WESTERGATE, PO20 3SQ

DRAWING TITLE: CONTRIBUTING AREA PLAN & EXCEEDANCE FLOW ROUTES

DRAWN	ENGINEER	CHECKED	APPROVED
MR	CS	CS	CS

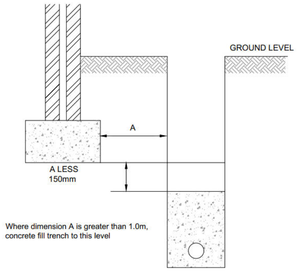
DATE	SCALE @ A1
JUNE 2025	1:200

JOB No.	STATUS	DRAWING No.	REV.
C3388	PL	201	P1



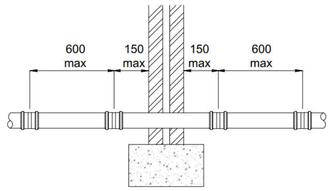
Pipes near buildings

(not to scale)



Pipes near buildings

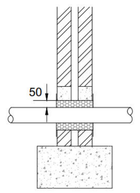
(not to scale)



A. Short length of pipe bedded in wall with joints formed within 150mm of each wall face. Adjacent rocker pipes of 600mm max. length with flexible joints.

Pipes through wall detail

(not scale)



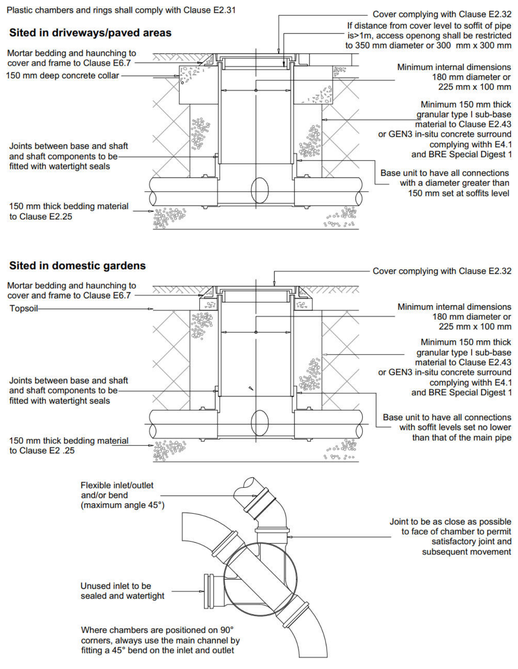
B. Arch or lintelled opening to give min 50mm space all round the pipe. Mask opeing on both sides of the wall with rigid sheet material to prevent entry of fill or vermin. Important Fill void with compressible material to prevent entry of gas.

Pipes through wall with lintel detail

(not to scale)

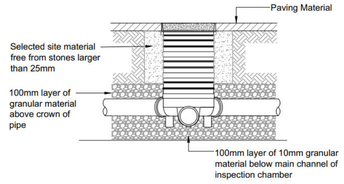
FIGURE B 23
TYPICAL INSPECTION CHAMBER DETAIL - TYPE E

Depth from cover level to soffit of pipe up to 2 m
Flexible material construction



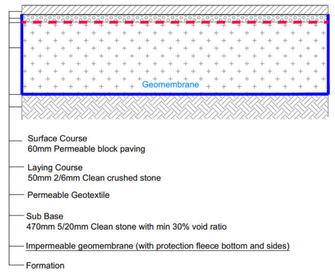
Note: Where the access chamber is in the highway (including any footway) the highway Authority can have specific requirements

(not to scale)



300mmØ SHALLOW INSPECTION CHAMBER DETAIL

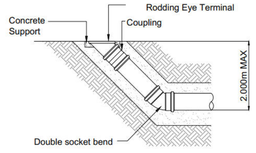
(scale 1:20)



DESIGNED BASED ON ASSUMED CBR >5%
FINAL SUBBASE AND CAPPING LAYER DEPTH SUBJECT TO CBR VALUE

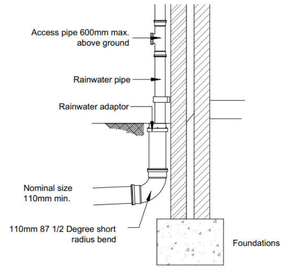
Proposed Permeable Block Paving Private Driveway and Parking Spaces Construction (PP1)

(scale 1:20)



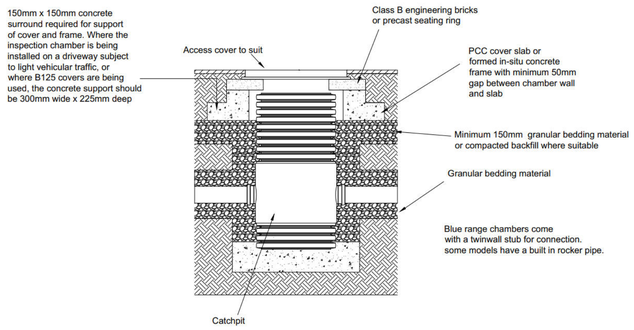
Rodding eye detail

(not to scale)



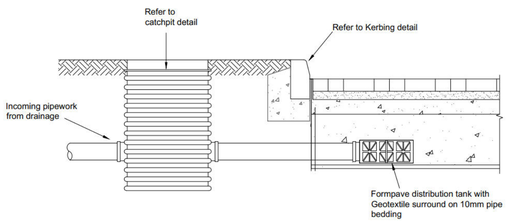
External Rainwater Pipe to Drain

(scale 1:20)



Typical Silt Trap Detail

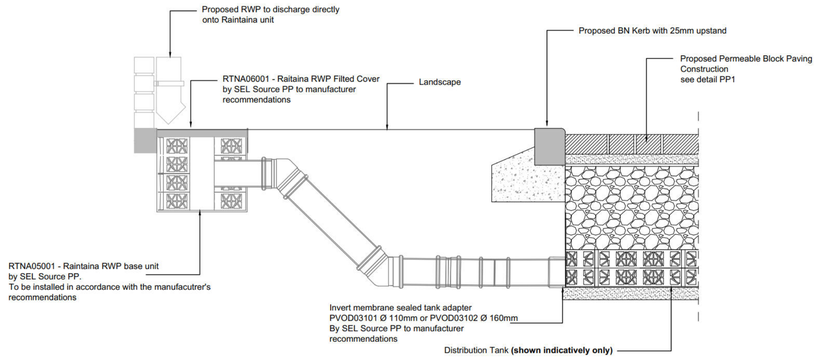
(not to scale)



Formpave Diffuser tank construction

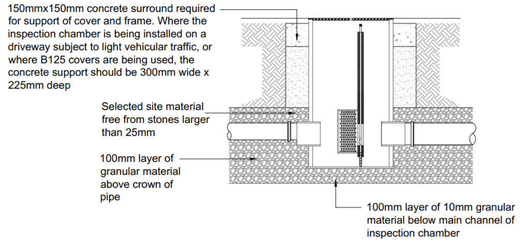
Single Unit: 0.354x0.708x0.150m DP

(scale 1:20)



Proposed Downpipe Filter Chamber with discharge connection to Distribution Tank

(not to scale)



Sel Controflow 500 Orifice Chamber

SEL Environmental LTD
Phone: 01254 589987
Email: sales@selenvironmental.com

(scale 1:20)

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cgs civils
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CLIENT: DEBORAH AND CHRISTOPHER BLOWS

ARCHITECT: SMITH SIMMONS & PARTNERS

JOB TITLE: LAND NORTH OF THE GRANGE, WESTERGATE, PO20 3SQ

DRAWING TITLE: PROPOSED TYPICAL CONSTRUCTION DETAILS, SHEET 1

DRAWN	ENGINEER	CHECKED	APPROVED
MR	CS	CS	CS

DATE	SCALE @ A1
JUNE 2025	AS SHOWN

JOB No.	STATUS	DRAWING No.	REV.
C3388	PL	301	P1

Recommended Plant Species
(for shallow media bioretention planters)

Grasses and sedges (for structure and surface stability)
Carex panicea (Carnation sedge)
Deschampsia cespitosa (Tufted hair grass)
Festuca rubra (Red fescue)
Luzula nivea (Snowy wood-rush)

Herbaceous perennials (for colour and biodiversity):

Geranium sanguineum (Bloody cranesbill)
Iris sibirica (Siberian iris)
Ajuga reptans (Bugle)
Veronica beccabunga (Brooklime)
Lythrum salicaria (Purple loosestrife – suitable for wetter zones)

Optional low shrubs (only if planter can structurally support):

Cornus sericea 'Kelsey' (Dwarf red osier dogwood)
Salix purpurea 'Nana' (Dwarf willow)

Planting Medium (200 mm depth)

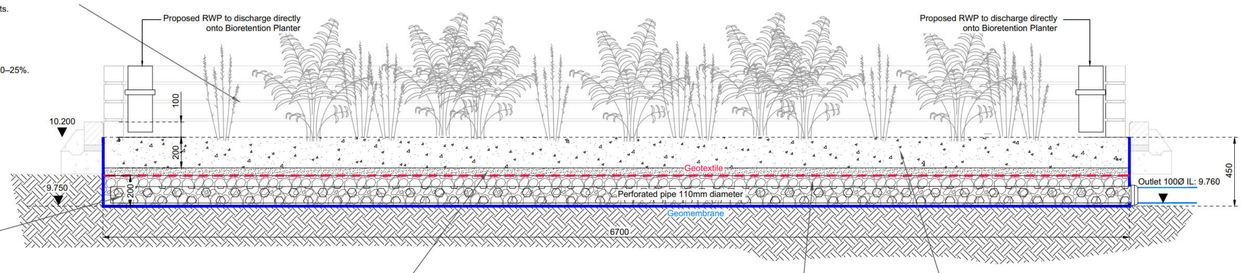
Composition: Approx. 70% washed sand, 20% loamy topsoil, 10% organic compost (by volume).

Free-draining and low in nutrients.

pH: 5.5 – 7.5.

Target bulk density: < 1.5 t/m³.

Designed porosity (void ratio): 20–25%.



Perforated Underdrain

Material: 100 mm dia. perforated uPVC or HDPE pipe laid to minimum 1:200 fall.

Function: Collects and conveys treated runoff to downstream drainage system or outfall.

Notes: Pipe surrounded by gravel media and wrapped with permeable geotextile.

Filter / Transition Layer – Depth: 50 mm

Composition: Clean, coarse sand or fine gravel (typically 2–6 mm particle size).

Function: Prevents migration of fine particles from the planting layer into the drainage layer below; assists in uniform drainage.

Notes: Washed, well-graded, low-fines content (<1%).

Drainage / Attenuation Layer – Depth: 200 mm

Composition: Clean angular gravel (typically 10–20 mm nominal size).

Function: Provides temporary water storage and facilitates drainage to the underdrain.

Design Porosity: Typically 30–35%.

Notes: Wrapped in geotextile where necessary to prevent clogging by fines.

Surface Planting Layer (Topsoil/Planting Medium) – Depth: 200mm
Composition: Loamy topsoil blended with washed sand (typically 60–70% sand, 30–40% loam and organic matter by volume).

Function: Supports vegetation growth while allowing infiltration and filtration of runoff.

Design Porosity (Void Ratio): Approximately 20–25%.

Notes: Free of stones >10 mm, roots, and debris. Organic content <5% by weight. pH between 5.5 and 7.5.

Bioetention Planter Detail

(scale 1:20)

STANDARD DRAINAGE NOTES

1. DO NOT SCALE FROM THIS DRAWING, REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
2. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
4. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
5. BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
6. ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
8. ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA
9. ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
10. ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND NO FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
11. ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
12. ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
13. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
14. STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
15. IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
16. NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
17. ALL EXISTING MANHOLE COVER'S, GULLIES, ETC, ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
18. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT
19. UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION
20. PROPRIETARY PRODUCTS TO BE INSTALLED IN FULL ACCORDANCE WITH MANUFACTURER'S GUIDANCE.
21. MANHOLE AND CHAMBER COVER GRADES:
    - 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
    - 'B125' IN ALL DRIVEWAYS
    - 'C250' IN PRIVATE PARKING AREAS
    - 'D400' IN CARRIAGEWAY/ACCESS ROAD

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	**Shall not be used for contract or construction purposes**
P = PRELIMINARY	**Shall not be used for contract or construction purposes**
T = TENDER	**Shall not be used for construction purposes**
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

REV	DATE	DESCRIPTION	BY	CHK	APP
P1	06.11.25	UPDATED TO ADC REQUIREMENTS	MR	CS	CS
P-	10.06.25	PRELIMINARY ISSUE	MR	CS	CS

FOR PLANNING ONLY

cgs civils
Consulting Civil Engineers

CLIENT
DEBORAH AND CHRISTOPHER BLOWS

ARCHITECT
SMITH SIMMONS & PARTNERS

JOB TITLE
LAND NORTH OF THE GRANGE, WESTERGATE, PO20 3SQ

DRAWING TITLE
PROPOSED TYPICAL CONSTRUCTION DETAILS, SHEET 2

DRAWN	ENGINEER	CHECKED	APPROVED
MR	CS	CS	CS

DATE	SCALE @ A1
JUNE 2025	AS SHOWN

JOB No.	STATUS	DRAWING No.	REV.
C3388	PL	302	P1

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	75.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Permeable Paving Storage	0.022	4.00	10.150	450	104364.161	494023.354	0.580
Existing Ditch			10.000	150	104350.463	494044.185	0.649
S2			10.120	500	104363.011	494030.537	0.604
RE2	0.003	4.00	10.150	150	104360.418	494030.704	0.400
Bioretention Planter	0.006	4.00	10.200	150	104349.154	494021.552	0.450
S1	0.002	4.00	10.150	450	104351.876	494014.203	0.455
RE1	0.002	4.00	10.150	150	104352.456	494007.262	0.380
S3			10.000	450	104351.658	494037.900	0.616

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	Permeable Paving Storage	S2	6.500	0.600	9.570	9.516	0.054	120.0	150	4.44	56.6
1.000	RE2	Permeable Paving Storage	15.900	0.600	9.750	9.570	0.180	88.3	100	4.32	56.6
3.000	Bioretention Planter	S1	5.700	0.600	9.750	9.695	0.055	103.6	100	4.13	56.6
2.000	RE1	S1	7.400	0.600	9.770	9.695	0.075	98.7	100	4.16	56.6
2.001	S1	Permeable Paving Storage	4.900	0.600	9.695	9.570	0.125	39.2	100	4.23	56.6
1.002	S2	S3	13.200	0.600	9.516	9.384	0.132	100.0	100	4.73	0.0
1.003	S3	Existing Ditch	3.300	0.600	9.384	9.351	0.033	100.0	100	4.80	0.0

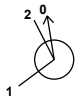
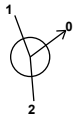
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	0.916	16.2	6.9	0.430	0.454	0.034	0.0	68	0.879
1.000	0.819	6.4	0.5	0.300	0.480	0.003	0.0	19	0.486
3.000	0.755	5.9	1.2	0.350	0.355	0.006	0.0	31	0.594
2.000	0.774	6.1	0.3	0.280	0.355	0.002	0.0	15	0.397
2.001	1.235	9.7	1.8	0.355	0.480	0.009	0.0	29	0.946
1.002	0.769	6.0	0.0	0.504	0.516	0.034	0.0	0	0.000
1.003	0.769	6.0	0.0	0.516	0.549	0.034	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	6.500	120.0	150	Circular	10.150	9.570	0.430	10.120	9.516	0.454
1.000	15.900	88.3	100	Circular	10.150	9.750	0.300	10.150	9.570	0.480
3.000	5.700	103.6	100	Circular	10.200	9.750	0.350	10.150	9.695	0.355
2.000	7.400	98.7	100	Circular	10.150	9.770	0.280	10.150	9.695	0.355
2.001	4.900	39.2	100	Circular	10.150	9.695	0.355	10.150	9.570	0.480
1.002	13.200	100.0	100	Circular	10.120	9.516	0.504	10.000	9.384	0.516
1.003	3.300	100.0	100	Circular	10.000	9.384	0.516	10.000	9.351	0.549

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	Permeable Paving Storage	450	Manhole	Adoptable	S2	500	Manhole	Adoptable
1.000	RE2	150	Manhole	Adoptable	Permeable Paving Storage	450	Manhole	Adoptable
3.000	Bioretention Planter	150	Manhole	Adoptable	S1	450	Manhole	Adoptable
2.000	RE1	150	Manhole	Adoptable	S1	450	Manhole	Adoptable
2.001	S1	450	Manhole	Adoptable	Permeable Paving Storage	450	Manhole	Adoptable
1.002	S2	500	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.003	S3	450	Manhole	Adoptable	Existing Ditch	150	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
Permeable Paving Storage	104364.161	494023.354	10.150	0.580	450		1	2.001	9.570	100
							2	1.000	9.570	100
							0	1.001	9.570	150
Existing Ditch	104350.463	494044.185	10.000	0.649	150		1	1.003	9.351	100
S2	104363.011	494030.537	10.120	0.604	500		1	1.001	9.516	150
							0	1.002	9.516	100
RE2	104360.418	494030.704	10.150	0.400	150		0	1.000	9.750	100
Bioretention Planter	104349.154	494021.552	10.200	0.450	150		0	3.000	9.750	100
S1	104351.876	494014.203	10.150	0.455	450		1	3.000	9.695	100
							2	2.000	9.695	100
							0	2.001	9.695	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	104352.456	494007.262	10.150	0.380	150				
						0	2.000	9.770	100
S3	104351.658	494037.900	10.000	0.616	450		1	1.002	9.384	100
						0	1.003	9.384	100

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
10	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	10	0

Node S2 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.600	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	1.0		
Invert Level (m)	9.516	Diameter (m)	0.025		

Node Permeable Paving Storage Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	9.570	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.470
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	20.000		

Node Bioretention Planter Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	208

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.1	0.0	0.200	8.1	0.0	0.400	8.1	0.0
0.100	8.1	0.0	0.300	8.1	0.0	0.450	8.1	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Permeable Paving Storage	120	9.630	0.060	1.9	2.4213	0.0000	OK
180 minute summer	Existing Ditch	120	9.369	0.018	0.4	0.0000	0.0000	OK
180 minute summer	S2	128	9.632	0.116	1.0	0.0227	0.0000	SURCHARGED
15 minute summer	RE2	11	9.765	0.015	0.3	0.0003	0.0000	OK
30 minute summer	Bioretention Planter	19	9.771	0.021	0.7	0.1656	0.0000	OK
30 minute summer	S1	18	9.715	0.020	0.9	0.0032	0.0000	OK
15 minute winter	RE1	11	9.782	0.012	0.2	0.0002	0.0000	OK
180 minute summer	S3	120	9.402	0.018	0.4	0.0029	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Permeable Paving Storage	1.001	S2	1.0	0.232	0.060	0.0689	
180 minute summer	S2	1.002	S3	0.4	0.427	0.067	0.0126	
15 minute summer	RE2	1.000	Permeable Paving Storage	0.3	0.295	0.047	0.0260	
30 minute summer	Bioretention Planter	3.000	S1	0.5	0.480	0.090	0.0065	
30 minute summer	S1	2.001	Permeable Paving Storage	0.9	0.508	0.090	0.0102	
15 minute winter	RE1	2.000	S1	0.2	0.269	0.033	0.0061	
180 minute summer	S3	1.003	Existing Ditch	0.4	0.428	0.067	0.0031	4.9

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Permeable Paving Storage	132	9.653	0.083	1.8	3.8060	0.0000	OK
180 minute winter	Existing Ditch	132	9.369	0.018	0.4	0.0000	0.0000	OK
180 minute winter	S2	132	9.653	0.137	0.9	0.0269	0.0000	SURCHARGED
15 minute summer	RE2	10	9.769	0.019	0.5	0.0003	0.0000	OK
15 minute summer	Bioretention Planter	11	9.777	0.027	1.3	0.2167	0.0000	OK
15 minute summer	S1	11	9.721	0.026	1.5	0.0042	0.0000	OK
15 minute summer	RE1	11	9.785	0.015	0.3	0.0003	0.0000	OK
180 minute winter	S3	132	9.403	0.019	0.4	0.0031	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Permeable Paving Storage	1.001	S2	0.9	0.226	0.057	0.0875	
180 minute winter	S2	1.002	S3	0.4	0.439	0.074	0.0135	
15 minute summer	RE2	1.000	Permeable Paving Storage	0.5	0.310	0.078	0.0378	
15 minute summer	Bioretention Planter	3.000	S1	0.9	0.537	0.150	0.0096	
15 minute summer	S1	2.001	Permeable Paving Storage	1.5	0.616	0.152	0.0130	
15 minute summer	RE1	2.000	S1	0.3	0.299	0.049	0.0089	
180 minute winter	S3	1.003	Existing Ditch	0.4	0.440	0.074	0.0034	7.3

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.30%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Permeable Paving Storage	112	9.716	0.146	3.9	7.5599	0.0000	OK
120 minute winter	Existing Ditch	112	9.371	0.020	0.6	0.0000	0.0000	OK
120 minute winter	S2	112	9.715	0.199	1.1	0.0391	0.0000	SURCHARGED
15 minute summer	RE2	10	9.777	0.027	1.0	0.0005	0.0000	OK
15 minute summer	Bioretention Planter	11	9.792	0.042	2.4	0.3348	0.0000	OK
15 minute summer	S1	11	9.734	0.039	3.0	0.0063	0.0000	OK
15 minute summer	RE1	10	9.791	0.021	0.6	0.0004	0.0000	OK
120 minute winter	S3	112	9.405	0.021	0.6	0.0034	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	Permeable Paving Storage	1.001	S2	1.1	0.275	0.065	0.1140	
120 minute winter	S2	1.002	S3	0.6	0.465	0.091	0.0157	
15 minute summer	RE2	1.000	Permeable Paving Storage	1.0	0.374	0.155	0.0631	
15 minute summer	Bioretention Planter	3.000	S1	2.0	0.678	0.330	0.0170	
15 minute summer	S1	2.001	Permeable Paving Storage	3.0	0.785	0.310	0.0220	
15 minute summer	RE1	2.000	S1	0.6	0.324	0.099	0.0148	
120 minute winter	S3	1.003	Existing Ditch	0.6	0.467	0.091	0.0039	9.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Permeable Paving Storage	116	9.759	0.189	4.9	10.1636	0.0000	SURCHARGED
120 minute winter	Existing Ditch	116	9.373	0.022	0.6	0.0000	0.0000	OK
120 minute winter	S2	116	9.759	0.243	1.1	0.0476	0.0000	SURCHARGED
15 minute summer	RE2	10	9.780	0.030	1.3	0.0005	0.0000	OK
15 minute summer	Bioretention Planter	11	9.800	0.050	3.1	0.3991	0.0000	OK
120 minute winter	S1	116	9.759	0.064	1.3	0.0102	0.0000	OK
15 minute summer	RE1	10	9.794	0.024	0.8	0.0004	0.0000	OK
120 minute winter	S3	116	9.407	0.023	0.6	0.0036	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	Permeable Paving Storage	1.001	S2	1.1	0.280	0.069	0.1144	
120 minute winter	S2	1.002	S3	0.6	0.479	0.102	0.0169	
15 minute summer	RE2	1.000	Permeable Paving Storage	1.3	0.408	0.202	0.0721	
15 minute summer	Bioretention Planter	3.000	S1	2.6	0.733	0.443	0.0213	
120 minute winter	S1	2.001	Permeable Paving Storage	1.3	0.291	0.132	0.0321	
15 minute summer	RE1	2.000	S1	0.8	0.334	0.131	0.0189	
120 minute winter	S3	1.003	Existing Ditch	0.6	0.481	0.102	0.0042	10.6

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Permeable Paving Storage	172	9.837	0.267	5.0	14.8714	0.0000	SURCHARGED
180 minute winter	Existing Ditch	172	9.374	0.023	0.7	0.0000	0.0000	OK
180 minute winter	S2	172	9.837	0.321	1.0	0.0629	0.0000	FLOOD RISK
180 minute winter	RE2	172	9.837	0.087	0.4	0.0016	0.0000	OK
180 minute winter	Bioretention Planter	172	9.837	0.087	0.9	0.7033	0.0000	OK
180 minute winter	S1	172	9.837	0.142	1.3	0.0226	0.0000	SURCHARGED
180 minute winter	RE1	172	9.837	0.067	0.2	0.0012	0.0000	OK
180 minute winter	S3	172	9.408	0.024	0.7	0.0039	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Permeable Paving Storage	1.001	S2	1.0	0.271	0.064	0.1144	
180 minute winter	S2	1.002	S3	0.7	0.498	0.118	0.0189	
180 minute winter	RE2	1.000	Permeable Paving Storage	0.4	0.182	0.062	0.1198	
180 minute winter	Bioretention Planter	3.000	S1	0.9	0.543	0.154	0.0429	
180 minute winter	S1	2.001	Permeable Paving Storage	1.3	0.230	0.130	0.0383	
180 minute winter	RE1	2.000	S1	0.2	0.222	0.033	0.0496	
180 minute winter	S3	1.003	Existing Ditch	0.7	0.501	0.118	0.0047	14.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Permeable Paving Storage	168	9.804	0.234	4.5	12.8754	0.0000	SURCHARGED
180 minute winter	Existing Ditch	168	9.374	0.023	0.7	0.0000	0.0000	OK
180 minute winter	S2	168	9.804	0.288	1.0	0.0564	0.0000	SURCHARGED
180 minute winter	RE2	168	9.804	0.054	0.3	0.0010	0.0000	OK
15 minute summer	Bioretention Planter	11	9.808	0.058	3.9	0.4657	0.0000	OK
180 minute winter	S1	168	9.804	0.109	1.2	0.0173	0.0000	SURCHARGED
180 minute winter	RE1	168	9.804	0.034	0.2	0.0006	0.0000	OK
180 minute winter	S3	168	9.408	0.024	0.7	0.0038	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Permeable Paving Storage	1.001	S2	1.0	0.271	0.064	0.1144	
180 minute winter	S2	1.002	S3	0.7	0.490	0.111	0.0181	
180 minute winter	RE2	1.000	Permeable Paving Storage	0.3	0.172	0.047	0.0965	
15 minute summer	Bioretention Planter	3.000	S1	3.4	0.776	0.566	0.0256	
180 minute winter	S1	2.001	Permeable Paving Storage	1.2	0.241	0.123	0.0383	
180 minute winter	RE1	2.000	S1	0.2	0.221	0.033	0.0376	
180 minute winter	S3	1.003	Existing Ditch	0.7	0.493	0.111	0.0045	13.6

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 98.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Permeable Paving Storage	176	9.952	0.382	6.7	21.7618	0.0000	FLOOD RISK
180 minute winter	Existing Ditch	176	9.376	0.025	0.8	0.0000	0.0000	OK
180 minute winter	S2	176	9.951	0.435	1.0	0.0853	0.0000	FLOOD RISK
180 minute winter	RE2	176	9.952	0.202	0.5	0.0036	0.0000	FLOOD RISK
180 minute winter	Bioretention Planter	172	9.952	0.202	1.3	1.6333	0.0000	FLOOD RISK
180 minute winter	S1	176	9.952	0.257	1.9	0.0408	0.0000	FLOOD RISK
180 minute winter	RE1	176	9.952	0.182	0.3	0.0033	0.0000	FLOOD RISK
180 minute winter	S3	176	9.411	0.027	0.8	0.0042	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Permeable Paving Storage	1.001	S2	1.0	0.279	0.065	0.1144	
180 minute winter	S2	1.002	S3	0.8	0.520	0.138	0.0212	
180 minute winter	RE2	1.000	Permeable Paving Storage	0.5	0.215	0.078	0.1244	
180 minute winter	Bioretention Planter	3.000	S1	1.3	0.564	0.212	0.0446	
180 minute winter	S1	2.001	Permeable Paving Storage	1.7	0.334	0.180	0.0383	
180 minute winter	RE1	2.000	S1	0.3	0.213	0.049	0.0579	
180 minute winter	S3	1.003	Existing Ditch	0.8	0.523	0.138	0.0053	17.1

7.5 Appendix E – Maintenance Schedule

Consulting Civil Engineers

Maintenance Schedule

Land north of the Grange, Westergate

For

Deborah and Christopher Blows

Rev – **P1**

Reference **C3388**

Date **10th June 2025**

Revision	Date of Issue	Comments	Prepared By	Checked By
PL-	10/06/2024	Initial Issue	MR	CS
P1	06/11/2025	Updated to ADC requirements	MR	CS

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1 Maintenance

1.1 Introduction

1.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the occupier will take on the responsibility of these duties as laid out in this report.

1.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

1.2 SuDS at Land north of the Grange, Westergate

1.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Permeable Paving and Bioretention Planter**

1.2.2 The SuDS features have been designed for easy maintenance and comprise:

- Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
- Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
- Remedial work – repairing damage where necessary

1.3 SuDS Drainage Maintenance Specification

1.3.1 Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for permeable paving

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rate and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

1.3.1 Bio retention systems

In order to maintain the functioning of the bio retention systems, the following maintenance requirements should be adhered to:

Table 18.3 Operation and maintenance requirements for bio retention systems

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspection infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockages	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

1.4 General Drainage Maintenance Specification

1.4.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	**Frequency**
Inlet Structures **Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.** **Strim vegetation 1m min surround to structures and keep area free from silt and debris**	Monthly
Inspections Chambers and below ground control chambers. **Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.** **Undertake inspection after leaf fall in Autumn**	Annually
Occasional Maintenance **Check topsoil levels are 20mm above edges of chambers to avoid mower damage.**	As necessary
Remedial Work **Repair physical damage if necessary**	As required

1.4.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	**Frequency**
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work	
Repair physical damage if necessary	As required
Monitoring	
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required